

SCIENCE.

FRIDAY, MAY 13, 1887.

COMMENT AND CRITICISM.

PROFESSOR ADAMS'S recent monograph on 'The college of William and Mary,' published by the bureau of education, is a valuable contribution to the history of the higher education in the south. Founded in 1693 by royal grant, this college is the oldest in the south, and, with the exception of Harvard, the oldest in America. This venerable institution has fallen upon evil days. During the civil war, nearly all of its property was destroyed, and the greater part of its endowment was lost. The college which gave Washington his degree of civil engineer, and to which, as chancellor, he gave his last public service; the college where Jefferson, Monroe, Randolph, Marshall, and other early fathers of our republic, were educated, — is now closed. Of its former faculty, only President Ewell remains; and we are told that at the beginning of each academic year he rings the college-bell, as a reminder that the institution still lives. Repeated efforts have been made by friends north and south, notably by Senator Hoar, to have congress reimburse the college for the destruction of its property during the war, but without success.

While we can join in the wish that the good old college may again see prosperous days, and commend highly Professor Adams's diligent search for the facts in the history of such an institution, we cannot too strongly condemn his suggestion that a civil academy for instruction, at public cost, in higher political education, is one of the needs of the hour. The land is dotted now with colleges of higher or lower degree, in which any young man may obtain all the instruction necessary, if he but have the necessary grit. The formation of a national school of paid students is by no means necessary, that we should have a supply of capable civil servants. It may be well enough for the government to support those men who are willing to fit themselves for the army and navy, which training may unfit them for civil pursuits: we cannot have modern soldiers and sailors in any other way. But in civil life we are in sore

No. 223 — 1887.

need of men who can understand the homely proverbs of Poor Richard, and who will not be misled into joining any anti-poverty society. Such men can get a school-training which they will make tell, from any village school, and will not ask the government for alms that they may the later live from the public purse. While a good clerk might be turned out by such a civil academy, may we always be able to throw the real burdens of government on the shoulders of those who have learned to carry their own weight.

AT A RECENT MEETING of the Engineers' club of Philadelphia, Mr. Edwin Ludlow spoke of a much-needed invention to facilitate the preparation of anthracite coal without injury to health. While engineering ability and mechanical skill have done wonders during the last decade toward putting the mining and preparation of coal on a scientific basis, making it possible to ship as high as twenty-six hundred tons of prepared coal from one breaker in a single day, still in every breaker, no matter how modern it may be, one will find the chutes, through which the coal passes from the screens to the loading-pockets, lined with boys from twelve to fourteen years of age, who sit there ten hours a day, picking by hand the slate from the coal as it passes along. The atmosphere of this screen-room is, in many cases, so laden with fine coal-dust that objects cannot be distinguished twenty feet away; and, while the breathing of this coal-dust does not seem to have any immediate effect on the boys' health, it undoubtedly lays the seeds for the bane of the coal-region, — miners' consumption. It strikes every thoughtful man, who looks down on from one hundred to two hundred boys working in a single breaker, that it is a very crude and expensive way of preparing coal.

We learn from Mr. Ludlow that various appliances have been designed, but that the only really successful one, as proved by actual experience, has been the water-jig. This undoubtedly removes the slate with a small percentage of waste of coal; and where the product of the

mine is wet, and water has to be used on the screens to effect a separation of the dirt from the coal, it is the best and most economical appliance that can be employed. But the greater part of the coal going to market comes from dry mines, where it would be a detriment to the quality of the coal, and a great expense, to use water. The waste water from the jig is also expensive to take care of, as in most localities it is no longer allowable to let it run, with the fine dirt it holds in solution, into the nearest creek, as the sediment will carry a long distance, and deposits itself where it will do harm, and entail a suit for damages. Enough tanks have therefore to be provided to allow all the waste water to thoroughly settle, so that the water and culm can be removed separately. Water itself, or rather the pure article, is both scarce and expensive during a part of each year throughout nearly the whole region. And if mine water is used, as is generally the case, the acid contained in it attacks the iron work of the jig, and makes frequent repairs necessary.

The principle the jig works on is based on the difference in specific gravity between coal and slate. The two enter the bottom of the jig together, and, by the pulsations of a large plunger in an adjoining compartment, water is forced up through the coal, lifting it, and allowing a fresh supply to come in. The coal is forced to the top and runs off with the water, while the slate, owing to its greater specific gravity, passes out through a separate opening in the bottom. What is needed, in Mr. Ludlow's opinion, is a dry jig, in which this separation will be effected by the use of air instead of water. One of the difficulties encountered in getting up such a jig is caused by the care with which coal has to be handled to prevent its chipping or breaking. It cannot be dropped on iron, or wire, or itself, without producing an appreciable percentage of waste. With the most approved rolls, the loss in rebreaking any size to a smaller one amounts to from ten to fifteen per cent. While the difference in specific gravity between coal and slate of the same-sized pieces is very great, still trouble would be experienced in any separation by an air-current with flat pieces of both slate and coal, on which the action of the air would vary, according as it acted on the edge or the whole side. The man who invents a successful dry jig, that will stand the test of actual trial, will un-

doubtedly make a very handsome thing by it. Not to be too cumbersome, a single jig should not have a greater capacity than five hundred tons per day; and, as the shipping capacity of the anthracite region is about two hundred thousand tons per day, it would take about four hundred to supply the trade.

PROFESSOR VAUGHAN OF MICHIGAN UNIVERSITY has been engaged in the study of the chemistry of tyrotoxinon, the principle discovered by him in poisonous cheese, and which he believes to have been responsible for a number of cases of poison due to ice-cream. Professor Vaughan concludes from his studies that tyrotoxinon and diazobenzol are identical. To a large cat a small bit of diazobenzol nitrate was given, dissolved in water. In a few minutes the animal began retching, and in three-quarters of an hour it vomited freely, and later was purged. The stomach, when opened, was found to contain a frothy fluid, and its mucous membrane was blanched. Thus, not only were the symptoms identical with those of tyrotoxinon, but the post-mortem appearance was the same as that observed in cats poisoned with tyrotoxinon obtained from cheese, milk, and ice-cream. From some oysters which poisoned nearly seventy people in Michigan lately, Professor Vaughan obtained the tests for diazobenzol. The symptoms produced by the oysters were identical with those observed after eating poisonous cheese, ice-cream, and milk. It is altogether likely that the active agent in all those foods which when partly putrid produce the same group of symptoms, is diazobenzol, probably combined with different acids. Professor Vaughan is now experimenting with the hope of ascertaining the nature of the micro-organism which produces this poison, but is not yet ready to make any definite report. It seems to be a germ which develops best in the absence of air, or with only a limited supply of air.

WE ARE NOW APPROACHING the season when the attention of teachers and pupils alike is turned toward the important matter of examinations. Review-work is begun, and there is a general arranging and polishing-up of knowledge in anticipation of the annual test. Since examinations play so important a part in our educational institutions from primary school to college, it is fitting that they should be the subjects of special thought and attention. For this reason we print

this week the instructive paper of Mr. Carr, and shall follow it shortly with a discussion on the function and conduct of examinations, to be participated in by well-known educators. The formulation of some test of knowledge that will avoid in as large a measure as possible the evil practice of 'cramming' is what is wanted. In this matter perhaps the schools might take a leaf out of the experience of the universities, and make the passing or not of an examination depend largely upon some original work which shall involve the principles sought to be conveyed in the class-room instruction. The system of marking we believe to be unsound in theory, and vicious in practice; and to its operations we ascribe many of the ill effects now observed to follow from competitive examinations. But the subject is a large one, and we commend it to the careful thought of our readers.

PROFESSOR JOWETT OF OXFORD, than whom no Englishman is better known for his interest and activity in educational matters, is a strenuous advocate of state aid to education; and that, too, not in the direction of elementary education alone, as is proposed in this country, but in the form of direct subventions to the so-called university colleges. Ten such colleges now exist in England, seven of them having been founded during the past decade. If two or three more are added, then provision will have been made for all the cities having over one hundred thousand inhabitants. The cost of the education in these colleges is about twelve pounds annually, — a sum not only greater than the students can afford to pay, but a good deal less than will suffice to keep the institutions in their present state of efficiency. "The financial prospect of these colleges," says Dr. Jowett, "is therefore the reverse of hopeful. It is practically impossible to support them by voluntary subscriptions. They do not appeal to the humane or religious feelings of mankind, like hospitals or churches; and there are many who think that the ambition of the poorer classes to have a better education ought not to be encouraged." Dr. Jowett touches on the many and varied benefits conferred by these university colleges not only on the places in which they are situated, but on the country at large, and urges that the sum asked for from the state is not large, and that it would be given to those who have done all they can to help themselves, that it might be proportioned to subscriptions raised in the various local-

ities, and that no new principle is involved. "No principle of political economy forbids the application of public money to the education of those who cannot afford to educate themselves. Such an expenditure is really one of the best affairs of business in which a nation can engage." There is some prospect, we understand, of Dr. Jowett's plea being effective, at least in some degree.

AN INTERESTING ARTICLE on 'Realistic and dramatic methods in teaching geography,' by William Jolly, appears in the March and April numbers of the *Scottish geographical magazine*. The author urges that the mechanical method of teaching now in general use be abandoned, and that 'things should be taught, not words.' He thinks that in the initiatory stages the use of the text-book should be entirely dispensed with, and that all teaching should be based on the use of the map and of models. For showing the elementary features of the earth's surface, he would use models, — water poured on a table, to show the relations between land and water, and clay or sand to show the phenomena of relief. He would then proceed to explain the use of the map. We are of the opinion, that, as far as possible, the natural phenomena of the country should be made use of for illustrative purposes, as models frequently give rise to ideas as incorrect as those produced by mere description. Good pictures, even, might be found more serviceable than clay and sand. Mr. Jolly emphasizes the necessity of thoroughly teaching the use and meaning of maps as showing the geographical phenomena of a country, as well as the usefulness of illustrating these phenomena by means of pictures and collections from different countries. This method has been adopted in many schools of Germany and Switzerland. We notice in the latest issue of the *Journal of the Aarau geographical-commercial society*, that this system is being supported by the Swiss geographical society. The Aarau society has arranged a collection of photographs, products, etc., of different countries, and sends it to the schools of Switzerland by turns, for use in geographical instruction. The St. Gallen society has recently resolved to take part in this enterprise, and has arranged a similar collection for circulation in the schools of eastern Switzerland. The principal difficulty in teaching the use of the atlas, and of making it the basis of geographical instruction, is the lack of a uniform atlas. This question was discussed by

the German Geographentag on April 17. After a long discussion, it was decided that the use of different atlases in one class was detrimental to the success of the teaching of geography, it preventing a thorough explanation of the meaning of the map, the material contained in the maps being too different in different atlases.

THE REPORTS OF THE SONORA earthquake are still very incomplete. As far as can be seen from the meagre notes published in the daily papers, the Sierra Madre, which forms the boundary between the states of Sonora and Chihuahua, was the centre of activity. The towns and villages on the Rio de Batepito on its western side, and those on the Rio Corralitos on its eastern side, suffered most severely. In the former valley, reports of loss of property and life come from Oposura (Moctozuma) on the Rio de Soyopa and Babiose. There are, however, two places of that name, — one on the Rio de Batepito, one in the Sierra Madre. On the east side Corralitos and Cases Grandes suffered severely. As the district lies midway between the Sonora and Mexican railways, news travels slowly, and the reports are much retarded. The first shock occurred on May 3, and was followed by other violent tremors, the latest reported being on May 8. The accounts of volcanic eruptions are very doubtful, as it seems that the steam from hot-springs and the smoke of forest-fires have been mistaken for eruptions. There are three lines of volcanoes in this district, — the New Mexican line of extinct volcanoes; the line of California, which meets the former at the head of the Gulf of California; and the Mexican line, which runs from Orizaba to the Revilla Gigedo Islands. It contains several active volcanoes. There are no signs of disturbances of any of these volcanoes during the earthquake, while one report refers to an eruption near the boundary of Guatemala. The shocks were felt in southern Arizona, New Mexico, and Texas, but not so strongly as in Sonora.

THE EXPLORATION OF THE ANTARCTIC REGIONS.

DURING a period when explorations were most vigorously carried on in all other parts of the world, the antarctic region remained as unknown as it had been for a long time. Since Cook, by his voyages, had proved the non-existence of an extensive Terra Australis, which former geographers supposed to occupy a great part of the southern

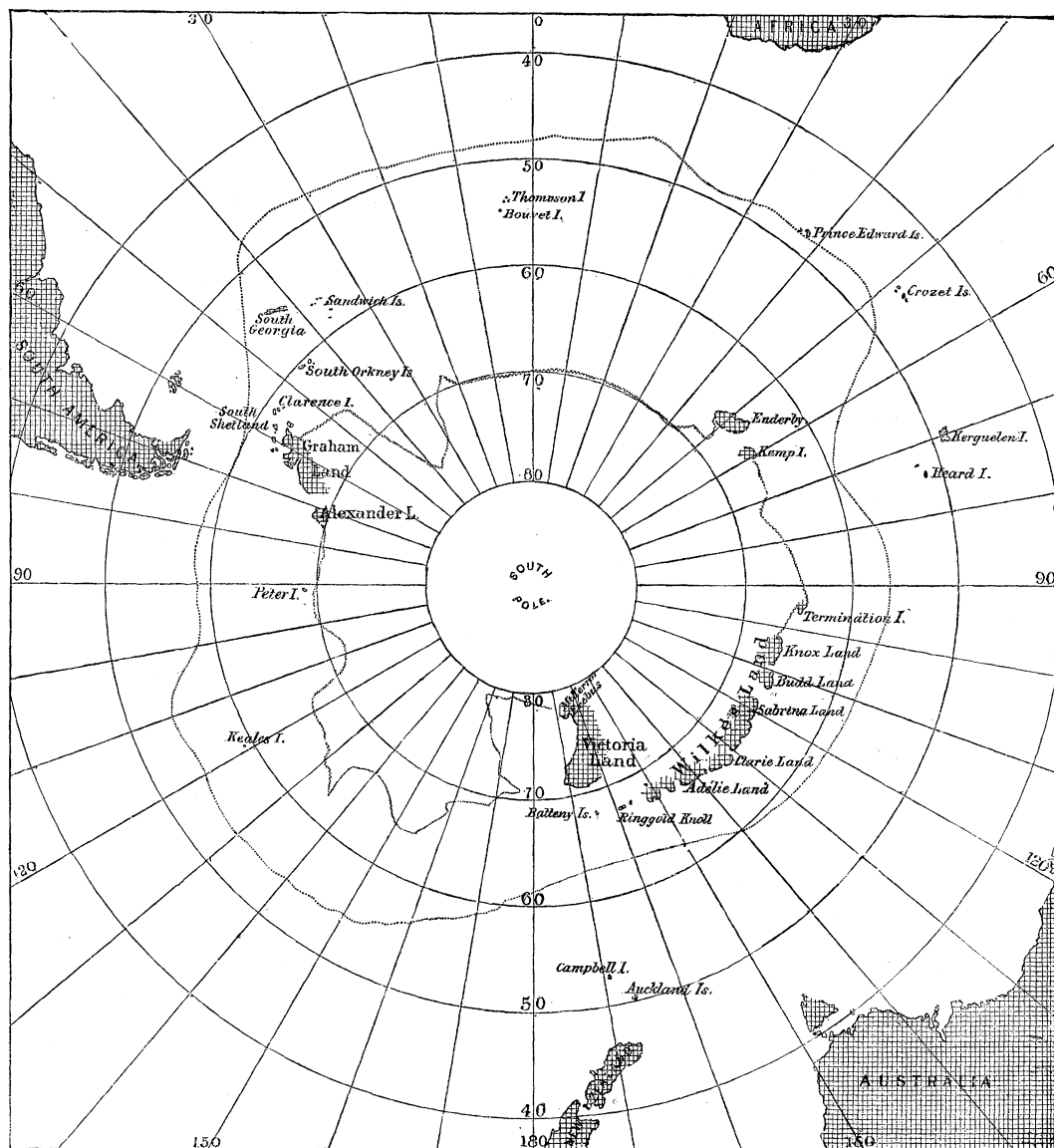
hemisphere, nothing worth mentioning was done until the beginning of the present century. After peace had returned to Europe, which had been shaken by revolutions and wars, polar explorations were resumed: Parry, Ross, Lyon, Scoresby, and Franklin enlarged our knowledge of the arctic regions; while Bellingshausen, Biscoe, Balleny, Wilkes, Dumont D'Urville, and James Ross explored the antarctic seas. But this period of lively activity in the southern hemisphere did not extend over more than twenty-five years, from 1819 to 1843. After that time the enthusiasm for arctic travel reached its highest pitch in the numerous attempts to rescue Franklin or to ascertain the fate of his unfortunate expedition; but the antarctic seas have never been visited again, and our knowledge has not been increased since the period mentioned.

It was not until quite recently that new efforts were made to revive the interest in antarctic exploration. Maury tried to organize an expedition, but it was in vain: he was unable to find any support, either in England or in America. The revival of interest is chiefly due to the efforts of G. Neumayer of Hamburg, whose frequent and energetic appeals had the effect of arousing many societies from their inactivity, and of awakening a new interest in the problems of antarctic geography. It was in 1861, when Neumayer was director of the observatory of Melbourne, that he tried to work for renewed explorations in those regions. Since that time he has continued to do so with unabating perseverance, and his frequent addresses and writings on the subject have principally created the present interest in antarctic exploration. In 1885 the German Geographentag discussed the subject very fully, and expressed itself in favor of renewed explorations in the antarctic regions. In the same year Admiral E. Ommanney brought the matter before the geographical section of the British association, and a committee was appointed, which reported favorably on the matter. This example was followed by the Scottish geographical society and the Royal society of Edinburgh. Later on, the Royal society of Victoria discussed the subject, and issued a report, in which they express the willingness of the Australasian colonies to render assistance to an imperial expedition if decided on, and the intention of the committee, meantime, to arrange for the despatch to the antarctic regions of a steam-whaler, with a small staff of observers, for the purpose of discovering some safe winter harbor for the projected expedition. The latest news is that Nordenskjöld proposes an expedition which is to last eighteen months.

At this moment, when we may hope that the

exploration of the antarctic regions will be resumed, it will be of interest to review the history of former expeditions. Cook had expressed the opinion that it was impossible to approach the land which he supposed to exist around the pole,

sent out Captain Bellingshausen, who discovered Alexander Island and the isolated Peter Island. The results of his explorations, which were published at St. Petersburg in 1831, did not become known until some years later, as frequently is the



MAP OF ANTARCTIC REGIONS SHOWING THE LIMITS OF OUR KNOWLEDGE.

on account of the heavy masses of ice met with. It was his opinion that these could originate only on an extensive land. Almost half a century had passed, and no new attempt had been made to continue his explorations, when Nicolaus I. of Russia

case with books written in Russian. He was followed by Weddell in 1822, who, on a sealing voyage south-east of South Shetland Islands, reached latitude $74^{\circ} 15'$ south, where he found the sea free from ice, navigable, and abounding with whales

and birds. For ten years we do not hear of any further attempts. Then one Mr. Enderby of London fitted out several vessels, and sent them to the Antarctic Ocean for sealing and exploring purposes. The first expedition, in 1830, was under command of Captain Biscoe, who discovered the coast of Graham Land and Enderby Island. He was followed by Kemp in 1834, who discovered Kemp Island. The problem of the south pole then suddenly attracted the attention of all nations. Balleny, who commanded another of Enderby's expeditions, discovered in 1839 the volcanoes of Balleny Island and Clarie and Sabrina Land, — two points of the extensive Wilkes Land, the existence of which was later on so much contested.

In the following year, Dumont d'Urville came in sight of Adélie Land, which is situated between the eastern and western discoveries of Balleny. He estimated the height of the land to be about 3,500 feet. It is covered with ice, and no bare patches were seen. On effecting a landing, however, he found some rocks, which proved it to be land, and not drifting ice. Later on, he sighted Clarie Land, which he describes as an ice wall four hundred feet in height. In 1838, d'Urville had visited Graham Land, without making noteworthy discoveries. In the same year, when d'Urville made his discoveries south of Australia, Wilkes visited that region, and sailed all along the coast of the land which bears his name to-day. As he did not approach it very closely, some of his land may have been drifting ice. Ross, on his expedition of 1840-45, sailed over the place east of Balleny Islands, where Wilkes had put land on his map. In 1842 Ross reached latitude $78^{\circ} 10'$ south, the farthest point ever reached. He discovered the highlands of Victoria Land, with volcanoes 12,000 feet in height, and sailed along the formidable ice wall which he found attached to the eastern side of this land. His voyage is by far the most prominent among the antarctic expeditions, on account of the experience of the commander in ice navigation, his perseverance and boldness, and the valuable observations on the physical geography and topography of the antarctic regions.

On the accompanying map the most southern points reached by these explorers are connected by a broken line which includes the unknown area around the south pole.

Except the short journeys of Moore in 1845, and Nares in 1874, no further attempts to penetrate into the Antarctic Ocean have been made. It seems that the singularity of phenomena presented in the antarctic regions did not excite as much interest as did those of regions the borders of which were known. Here the fragmentary state of our knowledge was brought to mind whenever vague

news of the unknown parts reached us, while no reports from the icy south pole kept up the faint interest it may have attracted at one time.

The geographical problems of this part of the world, nevertheless, are of the greatest importance. It is well known that the polar regions, particularly the south polar region, regulates the circulation of the oceans, and that its currents must be studied before it will be possible to understand thoroughly the currents of the southern hemisphere. The distribution of land and water, the depth of the ocean, the amount of ice, its thickness and distribution, must be studied for this purpose. Besides this, the meteorological phenomena of the southern hemisphere depend on those of the antarctic region, and our knowledge of the meteorology of the earth will be incomplete until such phenomena of the south polar region are thoroughly studied. The southern hemisphere is to a great extent covered by the ocean, and the land consists of narrow strips which have no great effect on the physical phenomena of the atmosphere: therefore they are not so complicated as those of the northern hemisphere, and their study will further the theory of meteorology. It is hardly necessary to mention the importance of researches on terrestrial magnetism in the antarctic regions. The important bearing of these problems on practical questions cannot be overrated. The seaman cannot dispense with the knowledge of the currents, winds, and magnetic elements, and there is hardly a class of people who will not be benefited by the progress of meteorology.

But, besides this, the scientific problems of the antarctic regions are of great importance. It is possible that in former times the arctic zone was a centre from which the organisms of the present period spread over the northern hemisphere. It will be important to know whether the south polar zone played a similar part in the southern hemisphere. The formation of the antarctic ice is probably very different from that of the arctic ice, because the summer temperature seldom rises to the freezing-point. The glaciation of this region is extremely extensive, and its influence on the formation of the surface of the land can best be studied there. Our knowledge of the geography of the earth will remain a fragment so long as an area of this extent remains unknown, particularly as the physical geography of the southern hemisphere depends to a great extent on that of this region. From this stand-point, the resumption of antarctic explorations is even more important than the continuation of arctic expeditions. Fortunately the chances of success are very good, as the Antarctic Ocean seems to be far more navigable than the arctic seas. The ice

is not obstructed by land, and therefore spreads more readily, leaving open water for the ships to pass through. Whalers and sealers are carrying on a successful hunt in the Antarctic Ocean, and undoubtedly an expedition would open new grounds to them. It is to be hoped that the interest in antarctic exploration which manifests itself in all parts of the world will lead to a new period of discoveries in the ice-bound seas of the south pole.

HEALTH MATTERS.

Distillery milk.

THE raid made by the officers of the New York board of health, on the cow-owners who bring milk to the city from animals fed on distillery swill, has awakened a new interest in this subject, which *Science* has discussed for the past two weeks.

For the benefit of those who are not informed, it may be well to explain what distillery swill is, and why it is regarded as objectionable food for milch-cows. In the manufacture of whiskey from rye, wheat, or Indian-corn, the ground grain, together with malt, is placed in a tub with hot water. The diastase present in the malt, acting as a ferment on the starch of the grain, changes it into glucose. After cooling, yeast is added, and fermentation takes place, resulting in the conversion of the glucose into alcohol and carbonic acid. The contents of the tub are then placed in a still and the alcohol is distilled off. The refuse is distillery waste or swill. In the above process, most of the starch has been changed into glucose. The swill contains a small amount of starch, together with cellulose, gluten, and some dextrine. The quantity of water in swill is very large, varying from seventy-five to ninety-five per cent.

It will be seen from the above statement, that, in order to get a sufficient amount of nutriment, a cow feeding on distillery swill must take into the stomach a very large amount of this waste, so large a proportion being water, and that in so doing the amount of carbohydrates taken is entirely inadequate to the demands of the system; and this want must, of necessity, result in a deterioration of the animal's health, and indirectly of the milk which it produces. It is an unnatural food for cows, as is shown by their dislike of it when first it is given them. In fact, in order to make them eat it, they must first be starved. Hassall quotes Harley as saying that "brewers' and distillers' grains and distillers' waste make the cattle 'grain-sick,' as it is termed, and prove injurious to the stomach of an animal. It has been ascer-

tained, that, if cows are fed upon these grains, etc., their constitutions become quickly destroyed."

The effect of taking so large a quantity of fluid by the animal is to increase the quantity of the milk-secretion and at the same time to cause diarrhoea. We have stated that the quality of the milk produced from cows fed on distillery swill is very inferior. In support of this statement, we quote some analyses made by Dr. E. H. Bartley, chief chemist of the Brooklyn board of health. In a report made by him he says, "The effect upon the composition of the milk, of feeding cows on distillery or vinegar swill, is shown by the following analysis of three samples of swill-milk recently made by me, as compared with normal milk of cows fed on ordinary food:—

	First.	Second.	Third.	Average of 300 analyses of normal milk.
Specific gravity	1,030.50	1,030.10	1,031.60	1,031.00
Water.....	89.46	88.68	87.56	87.41
Solids.....	10.54	11.32	12.34	12.59
Fat.....	2.03	3.02	2.55	3.66
Sugar.....	2.83	2.74	4.11	4.82
Caseine and ash	5.78	5.66	5.68	4.46

It will be seen from these analyses that the fat and sugar are both deficient in the milk of the cow fed on distillery swill, while the caseine is increased. This is just what would be expected from the character of the food. When it is remembered that human milk contains more sugar and fat than normal cow's-milk and much less caseine, we can readily understand what the effect of such milk must be upon small children fed upon it. The amount of caseine being great, the curd of the milk is increased and the digestion made more difficult. When such milk is rendered slightly acid, or is allowed to coagulate spontaneously, a marked difference is noticed in the character of the curd formed, from that produced in normal milk. In the former the curd is tough and hard, and shakes to pieces with greater difficulty; so much so, that I have been able in a few cases to identify swill-milk by this property of the curd. In order to make such a milk agree in composition, even roughly, with human milk, one and one-half quarts of water must be added to one quart of milk, and then cream and sugar added to supply these ingredients; for, after the water has been added to dilute the caseine, the mixture would contain about one-fifth the necessary quantity of sugar, and about one-fourth the

necessary fat, to say nothing of the normal inorganic salts. It must be remembered that those milkmen who keep cows have a large demand for 'one cow's milk' to supply food for small children, and consequently this milk is more likely to be given to children than to adults, with all the evil consequences which must follow. This fact makes it imperative that such milk should be strictly kept from the market."

In support of the statement which we have made, that distillery milk is injurious, the following history is given. In August, 1882, a child four months old died in Brooklyn. At the autopsy the stomach was found to contain coagulated milk and a firm lump over three inches in diameter. The stomach was reddened. The intestines contained a pale slimy material characteristic of inflammation. Its membrane was studded with enlarged glands. In the opinion of the pathologist who made the autopsy, Dr. Leuf, death was due to exhaustion, — a result of gastro-enterocolitis, augmented by the presence in the stomach of the firm clot of coagulated milk, which was too firm for the child to vomit up or pass down into the gut, and therefore acted as a foreign body and irritant. The mother said the child was fed on 'one cow's milk.' Dr. Bartley analyzed the milk, and found it to be 'swill' milk. Its analysis was, water, 89.46; fat, 2.03; sugar, 2.83; caseine and salts, 5.74.

In commenting on the above fatal result, Dr. Bartley says, "Swill-milk does not coagulate as readily as ordinary milk, but the curd formed is much firmer and less easily disintegrated in the former than in the latter. In most cases the flavor of the swill can be tasted in the milk after it has stood some hours in a corked bottle." Dr. Bartley, as a result of his study of the subject, says in regard to the feeding of swill to cows, "It is a practice which we cannot condemn too strongly, a practice which undoubtedly adds largely to the digestive troubles of infancy and childhood, and especially to the cases of cholera infantum so called, in the summer months."

In the first annual report of the New York state dairy commissioner, E. W. Martin, chemist, says, "Various kinds of unhealthy foods will produce milk not only abnormal in the proportions of its constituents, but in its reactions; and such milk must be considered unhealthy, although produced by an apparently healthy animal: as, for instance, the use of distillery swill."

In connection with this subject, it may be of interest to consider for a moment the mortality among infants, and its principal factor. In five months from June 1, 1884, 259 children under five years of age died in New Haven, of which num-

ber, 111 were from diarrhoea. The particulars of thirteen cases were not ascertained; but of the 98 cases whose histories were obtained, 14.3 per cent were children nursed by their mothers; 77.5 per cent were bottle-fed wholly or in part from the time they were two months old; 8.2 per cent were children who were longer nursed than the others, but were bottle-fed at the time they were taken sick. Published statistics seem to show that a large majority of those who die in infancy are fed by hand, that is to say, on cow's-milk. In countries where the death-rate under one year of age is least (under 15 per cent in Norway, Sweden, and Ireland), the practice of hand-feeding is almost unknown; while, on the other hand, where hand-feeding is the rule, as in Lower Bavaria and the Palatinate, 50 per cent of the children die before reaching the age of one year. From this view of the subject, the importance of the purity of the milk-supply cannot be exaggerated, and all public-minded citizens can do good service by fostering a public opinion which will sustain boards of health in their efforts to suppress traffic in swill-milk.

ANILINE TREATMENT OF CONSUMPTION. — A new treatment of consumption has been proposed by Professor Kremianski of Russia. It having been demonstrated that the most dilute solutions of aniline were fatal to the tubercle bacillus, Kremianski suggested that aniline might be inhaled so that it would enter the circulation and also come in contact with the diseased pulmonary tissue, and destroy the bacilli wherever they might be. As a result, the cavities in the lungs would be converted into healthy granulating ulcers which might be expected to cicatrize. The Russian commission which was appointed to investigate the claims of this new method of treatment has experimented on a number of animals, which were fatally affected by small doses of aniline. The commission has concluded that aniline is not harmless to animal life, but, on the contrary, very poisonous indeed, and that it also exerts no beneficial effect on phthisis. Dr. Nesteroff tried this treatment upon a consumptive, with the result that he became rapidly worse, and died in a fortnight. It is more than probable, that, after this report, the aniline treatment will be abandoned.

SCARLET-FEVER-INFECTED MILK. — The health officer of Edinburgh has recently submitted a report of the facts connected with an epidemic of scarlet-fever in that city. His inquiry was with special reference to the connection between this outbreak and the milk-supply, and has resulted in showing that the affected district was supplied

from a source which was contaminated shortly before the commencement of the epidemic. The farm where the disease existed was daily sending to the city one hundred and twenty gallons of infected milk. This subject has been considerably discussed in Edinburgh recently, and a letter from a physician which appeared in the daily press, recommending that all milk should be boiled five minutes, has resulted in the general adoption of the suggestion throughout the city. Scarlet-fever appears to be very prevalent in Edinburgh, there having been at one time one hundred and ninety-nine patients in the city fever-hospital.

YELLOW-FEVER INOCULATION. — Dr. Urricoechea, surgeon of a battalion in Colombia, inoculated five of his soldiers for the prevention of yellow-fever. Twenty minutes after the operation the temperature gradually ascended to 40° C., accompanied with all the symptoms of yellow-fever. This lasted forty hours, at the expiration of which the fever and all attendant symptoms had disappeared. At the present time the inoculated soldiers are exposed to the infection. Dr. Bustamente, a physician of Cucuta, Colombia, reports that he has inoculated forty persons, and in many of them a fever, with many of the characteristics of yellow-fever, has presented itself; this fever, developed by inoculation, varying several tenths of a degree, and in some cases ascending to 41° C., but never presenting the most grave symptoms of yellow-fever. Dr. Bustamente says that the result of his observations justifies him in stating positively that the fever produced by inoculation is attended with no danger, and that it is safe to inoculate, as he has already done, persons from the age of two years upwards. Many of the persons inoculated by him have been exposed to yellow-fever, and in no case has the fever attacked them.

GELATINE LIQUEFACTION BY BACTERIA. — Dr. Sternberg has been studying the liquefaction of gelatine by bacteria, and has ascertained that it is due to a soluble chemical product which is formed during the active growth of the liquefying organisms, and that a comparatively small amount of this substance will liquefy gelatine quite independently of the living organism. Dr. Sternberg expresses the hope that some chemist will take up the question with a view to ascertaining the exact nature of this substance.

WATER-FILTRATION. — A very interesting series of experiments in the filtration of water has recently been made by Dr. G. T. Swarts, and reported by him to the Rhode Island medical society. He finds that, when first used, some filters successfully remove some of the organisms which

the water contains, but that tests made seventeen days later showed in every instance a marked increase in the number in the filtered as compared with the unfiltered water. In one case the unfiltered water contained thirty-six colonies, and after passing through the filter there were 2,000; in another case the number was 10,000. An examination made on the seventieth day showed the number of colonies increased to 117,000. The explanation of these results is, that, in passing through the filter, some of the micro-organisms present in the water are retained in the filter, and at the same time some of the albuminoids which are present are also retained. These latter serve as pabulum for the micro-organisms, and the latter increase enormously under these favorable conditions, and water subsequently passing through the filter takes them up in large numbers. With every possible precaution in sterilizing and cleansing the filter, the number of organisms in filtered water exceeded those in unfiltered by several thousands; especially is this marked if the filter is in a warm room or in proximity to a hot-water pipe. While the bacteria ordinarily found in water are harmless, still it is possible that those of cholera or typhoid-fever might be present in drinking-water; and the practical application of these observations of Dr. Swarts is, that such germs would not only not be filtered out in the process of filtration, but that their number would probably increase many times in the filter itself. The filtration of water is therefore of no use when the presence of pathogenic organisms is suspected; and recourse should, under such circumstances, be had to boiling, it having been abundantly demonstrated that all organisms in water are destroyed at the boiling-point, if that temperature is maintained for one hour.

THE HUMAN FACULTIES.

Mind and muscle.

THE full significance of the modern view of the relation of body to mind is well brought home by the success of a recent experiment upon a dozen dull, sluggish, shiftless, illiterate inmates of the Elmira reformatory. The men were not exactly feeble-minded, but were dull and stupid, had made no progress in school-work, and seemed incapable of a prolonged mental effort. The class was formed on June 5 of 1886, when the men were, on the average, 22.9 years old; they had been committed for rather low orders of crimes, for which the law would have imposed an average sentence of about seven years; had one and all never learned a trade; and exhibited the usual amount of intemperance, hereditary taint, and lack of moral

development, which can be plainly read on the typical physiognomy of a criminal. Their average weight was 134 pounds; their height, 5 feet 4½ inches; and chest-girth, 32¾ inches. They were subjected to a carefully selected and weighed diet, to water and vapor baths, to kneading and massage; underwent a systematized training in dumb-bell and other gymnastic exercises; were drilled in keeping step and marching; and altogether lived (outside of the usual shop-work) very much the life of an athlete under training. As was to be expected, the first effect was a decrease in weight (of 4.37 pounds on July 1); but on Nov. 6, when the class discontinued, the average increase of weight was 1.23 pounds. Their muscles, previously soft and flabby, were now hardened and active; their shuffling gait was abandoned for an elastic walk; the dull and stolid look gave way to a brighter and more intelligent expression. But a special object was to see the effect of all this on their mental capabilities. When they began, one could neither read nor write; a second could barely do so; four understood long-division, but not well enough to get a correct answer; while the rest were wrecked before finishing simple division. Their average work in the school register prior to this experiment was 45.25 out of a possible 100; during the five months of training it was 74.16. Add to this the statement of the instructors, that the numbers fail to express the real improvement which their actions and spirit portrayed, and one appreciates the real success of this valuable experiment. Of course, the dullards were not made scholars, and to mentally awaken men of 23 is a different task from arousing a growing boy; but it shows that even in this low type of humanity there is a latent mental power capable of being acted upon for the good of its owner.

The rationale of this process, modern physiology can well explain. The muscles are connected by nerves with motor centres in the brain: they are the organ of the will, because their contraction is under the control of the brain-centres. When we exercise a muscle, we not only make it grow and develop, but we also strengthen the brain-centre that controls it. The language of the muscles appeals to the very root of human nature: the first step in educating idiots is to get them to move their limbs in an orderly way and at command, to educate their motor centres. Just so the dull brains of these criminally inclined men can be best aroused by arousing their motor centres. This effects a more vigorous vitality of the whole brain, and is the first step towards a higher psychic life.

Dr. Wey, to whom the credit of this painstaking work belongs, appends to his story separate

photographs and a composite (unfortunately a poor one) of the group which will bear out the description of the men above outlined.

TRAITS OF CRIMINALS. — An Italian scientist, Marro, finds that criminals are more apt than normal people to be the descendants of very young and of very old parents in opposition to parents of middle age; and the same is true of the insane. In a table founded on 1,865 normal men, 456 criminals, and 100 insane, 8.8 per cent of normal men were born of parents in the growing period of life, 66.1 per cent of parents in the period of maturity, and 24.9 per cent of parents who had already reached the declining period of life. Similar percentages for criminals are 10.9, 56.7, and 32.2; and for the insane, 17.0, 47.0, and 36.0. The same writer also finds that the bodily temperature of criminals is slightly higher than that of normal persons, being about 37°.07 C. in thirty cases which he examined.

THE WRITING AND PRINTING OF THE DERANGED. — The manuscripts of neuropaths — a word wide enough to include the slight and the severe disturbances of mental sanity — present certain typical characteristics. They abound in italicized words; in exclamation-points and punctuations after almost every word; in frequent use of capitals; in various sizes of writing, particularly much very large writing; and the like. It is not often that such people have the opportunity of going to print and converting the compositor to their peculiar system of typography. M. Richet prints a few specimen pages of such an author, and counts twelve different kinds of letters in seventeen lines, besides the usual capitals, exclamation-points, and so on, in great abundance. All this is significant of an excited, prancing state of mind, closely allied to delirium and mania.

COLORED SOUNDS. — Mr. Galton, in his 'Inquiries into human faculty,' has collected a number of very interesting and strange cases of persons to whom certain sounds always call up certain colors. In one case a whole language was developed for translating colors into sound and back again, and this favored individual could read words out of a wall-paper pattern, or paint a pattern to order to represent a word. Two French writers, Lauret and Duchaussoy, recently describe a case the peculiarity of which is its hereditary character. The gentleman in question has colors for articulated sounds, but not for musical ones. Both his son and daughter have a similar faculty. The father and daughter agree quite closely on the colors going with the vowel and consonant sounds; but the names of the numerals

are quite exceptional. While words seemed colored to them only when spoken very slowly and separately, and then simply take on the colors of the component sounds, particularly the vowels, the names of the numerals have distinct colors which are entirely different in father and daughter. Intense thought of a sound can bring up the color just as really hearing it does.

EXPLORATION AND TRAVEL.

Stanley's march.

ADVICES from Bansa-Manteka (about midway between Banana and Stanley Pool), dated March 29, say, "Mr. Henry M. Stanley, with his expedition for the relief of Emin Bey, has arrived here. All the members of the party are well. Mr. Stanley has decided to take a route by way of Stanley Falls for Emin's camp at Wadelai. He will restore the authority of the International association at Stanley Falls, install Tippo-Tip, and afterward ascend the Mburu, which is now known to be for a great part navigable. At the point where navigation ceases, the caravan will start across the country, striking the Albert Nyansa at Murswur, where Stanley intends to form a fortified camp, and then send in advance boats to inform Emin of the arrival of the expedition, and solicit transportation to Wadelai by Emin's two steamers. The caravan, which presents an imposing spectacle, is about to leave here for Leopoldville. Four bodies consisting of twenty-five men each, commanded by Europeans, will go in advance to drive off the marauders guarding the route. The association's steamer the Stanley, the Livingstone mission steamer Henry Read, and the trading steamer Florida, will wait at Leopoldville to carry the expedition to the upper Kongo. The enterprise has caused a sensation among the natives. Many men from the factories at Banana and Boma are flocking to join the expedition, news having spread of the return of the 'white prophet' who will restore order among the people."

This report confirms the views expressed in some letters on the state of affairs on the Kongo, published by the Paris geographical society, to which we referred in *Science* of April 1, saying that the intercourse on both banks of the Kongo as far as Stanley Pool was interrupted by the natives attacking the caravans. Slow though the progress be, we may hope, however, that the Kongo association will succeed, after all, in opening central Africa to commerce. Even the bitterest enemy of the association cannot deny that great progress has been made since the first steps of opening the Kongo route were taken. Though

the aspect is not so glowing as the association represents, we are confident of the final success of the numerous efforts for gaining a foothold in the Kongo basin.

Stanley's route leads through one of the most unknown parts of Africa, the exploration of which will lead to the discovery of the watershed between the upper Kongo and the Mvutan Nsige.

NOTES AND NEWS.

THE Congress of German teachers, to be held at Gotha during the latter part of this month, will discuss the following questions: 1. In what respects can the school contribute to the solution of the social question? 2. Is the standard of morality among the masses higher than formerly, and, if so, how much of the credit of this is due to schools? 3. What external circumstances have a beneficial, and what have a detrimental, effect upon the work of the teacher? 4. How can history be used as a means of forming character? 5. The teacher as educator. 6. Is the continuance of public examinations desirable or not? 7. The educational value of singing. 8. The regular hygienic inspection of the school by a physician. 9. Educational walks with the pupils as object-lessons. 10. Instruction and reading books on the principle of the *Realschule*. 11. Discipline the *sine quâ non* of school-education. 12. Refuges for boys and girls. 13. Reformatory education. 14. The education of girls. 15. The need for a general simplification in the present spelling. 16. The exercise of the franchise by the teacher, both at general and municipal elections, is of the highest importance.

— The schools of Vienna are henceforth to give instruction in civics as part of the regular elementary teaching. This step is taken in accordance with a municipal decree.

— The prize of 25,000 francs, offered by the King of the Belgians for the best essay on the best means of improving the study and the teaching of geography, has been awarded to Anton Staubers, professor at the gymnasium at Augsburg.

— Sir Henry Sumner Maine, well known as the author of 'Early history of institutions,' 'Ancient law,' and 'Popular government,' has been chosen Whewell professor of international law at the University of Cambridge, in succession to Sir William Vernon Harcourt, resigned.

— Lord Rosebery is to be the Liberal candidate for the lord-rectorship of Glasgow university at the next election.

— Vienna university has now 6,135 students on its books.

— Harvard's two hundred and fiftieth anniversary and Columbia's one hundredth seem insignificant when we read that the University of Bologna will next spring celebrate the eight hundredth anniversary of its supposed foundation, the exact date of which is not known.

— M. Bernard Perey, whose books on infant and child psychology have been so successful, is at work on another of the same character, entitled 'La petite fille.'

— The University of Utrecht has now 37 professors, — theology, 4; law, 7; medicine, 9; science, 10; letters, 7, — 7 lecturers, and 5 priv-docents. 541 students are attending the university.

— After a heavy shower in Washington last week, the gutters and low places were covered with a deposit of fine yellow powder. Professor Ward pronounced it vegetable pollen, which came from the pine-trees of the district. It was very light, and was carried into the upper regions and washed out by rain. Professor Ward said, "It is the male element of the pine-trees, which usually shed their pollen at this season. It consists of minute grains, like little spores, and to the naked eye looks like yellow dust, but, subjected to the microscope, the grains have different shapes, which differ with the varieties of pine. It is common wherever pine-trees exist."

— The U. S. geological survey will collect all attainable information regarding the recent earthquakes in Arizona. Circular letters of inquiry will be sent to residents on the area affected, as usual. The disturbed area seems to be a circle of some four hundred miles radius, fully one-quarter as large as the Charleston earthquake, and nearly one-third of the area of the Riviera earthquake of last February.

— Dr. Sternberg left, May 3, for Rio de Janeiro, to investigate yellow-fever. He expects to return in September.

— Houghton, Mifflin & Co. have just published, in the 'American commonwealths' series, Prof. Alexander Johnston's history of Connecticut. Lee & Shepard have in preparation new editions of 'Milch cows and dairy farming' and 'Grasses and forage-plants,' by C. L. Flint of the Massachusetts state board of agriculture. Both are being carefully revised, and brought down to date.

— Sir Austen Henry Layard is now preparing for the press his early adventures in Persia, Susiana, and Babylonia, which will include an account of his residence among the Bakhtiyari and other wild tribes before the discovery of Nineveh. It will be published by Mr. John Murray.

LETTERS TO THE EDITOR.

*.*The attention of scientific men is called to the advantages of the correspondence columns of SCIENCE for placing promptly on record brief preliminary notices of their investigations. Twenty copies of the number containing his communication will be furnished free to any correspondent on request.

The editor will be glad to publish any queries consonant with the character of the journal.

Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.

Osteological notes.

In *Science* for April 15, Mr. F. A. Lucas takes very courteous notice of my observations upon the rudimentary metacarpals of *Bison bonasus* (the auroch). As I remarked therein, the data were altogether too fragmentary upon which to draw conclusions. Still, it would seem, so far as my observations go, that the American bison exhibits only one rudimentary metacarpal, and that one invariably the fifth; while the European bison, according to Owen, develops both second and fifth. The skeleton in the Museum of comparative zoölogy presents only one, the second, without a trace of an articulating facet for the fifth.

I have again carefully examined the eight disarticulated and the two mounted skeletons of the *Bison americanus* in this museum, and in not one do I find a trace of an articulating facet for the second metacarpal. In *Bos taurus* the same is true, with the exception that occasionally, in place of the second metacarpal, there is present a very rudimentary styloid completely ankylosed to the cannon bone, and appearing as an exostosis. It could not be termed in any sense a rudimentary metacarpal.

Mr. Lucas says that an examination of four or five of the skeletons of *Bison americanus*, with which the U. S. national museum has lately provided itself, shows that in every case, rudiments of the second and fifth metacarpals are present, and that, as they are all *in situ*, there can be no mistake in the matter.

Possibly Mr. Lucas and myself differ as to what constitutes a rudimentary metacarpal; and I maintain that a distinct metacarpal, however rudimentary, requires the presence of an arthro-dial facet upon the corresponding surface of the cannon bone. Nor do I believe, that, once such facet is developed, it ever disappears.

I can find no authority, except Owen on *Bison bonasus*, that speaks of the Bovinae as having more than one rudimentary metacarpal, and that the fifth.

If, as Mr. Lucas says, "there exists on the mounted skeleton of *Bison americanus* in the U. S. national museum a well-defined articular facet for the second right metacarpal," I yield.

At present my personal observation allows me to make the following deductions:—

1. That *Bison americanus* exhibits only a single rudimentary metacarpal, and that invariably the fifth.

2. That *Bison bonasus* may exhibit one or both rudimentary metacarpals; if only one, that this may be either the second or fifth. D. D. SLADE.

Cambridge, April 19.

With Dr. Slade's permission, I will add a few lines to his polite rejoinder to my note of April 15, he having kindly permitted me to read it before publication.

I fear I must indeed differ with Dr. Slade as to what constitutes a rudimentary metacarpal, holding that a bone, be it never so small, if constantly found

occupying the position of a metacarpal, must be considered as its degenerate representative, even if not articulating with the carpus or metacarpus by means of an arthrodial facet. This assumption would seem to be borne out by such cases as those of the telemetacarpal deer, in which the distal portions alone of the second and fifth metacarpals are present, and there is no articulation whatever with the cannon bone.

Would it not also be equally correct to deny the right of the 'spurious hoofs' in bison to be called phalanges because they have no connection whatever with the metacarpals?

Now, in *Bison americanus* there is in every 'rough skeleton' examined a bone about ten millimetres in length, occupying the place of the second metacarpal. Although this bone very rarely exhibits the slightest trace of an arthrodial facet, it is nevertheless, from my stand-point, to be considered as a rudimentary metacarpal. If not a metacarpal, what is it? In two skeletons out of six, there is a small facet on one leg only, but the little bone above mentioned is the bony core of a symmetrically shaped

The maxillo-palatines of *Tachycineta*.

The person who 'found fault' with Dr. Shufeldt's figure of *Tachycineta thalassina* (see *Science*, ix. No. 221) would like to say a few words by way of explanation. I regret that my remarks should have been construed as mere fault-finding. Nothing was further from my intentions, and I should be extremely sorry to have required the many courtesies received at the hands of Dr. Shufeldt in any such manner. The shape of the maxillo-palatines of *Tachycineta* constituted one of the links in the chain of Dr. Shufeldt's argument; and, as my own conclusions in the subject under discussion were quite different from his, it was needful for me to point out any flaws, either of text or figure, which had a bearing on the subject. While, at the time of writing the 'Affinities of *Chaetura*,' there was no specimen of *T. thalassina* at my disposal, I did have many specimens representing every other species of North American swallow. All of these agreed with one another in the shape of the maxillo-palatines, and

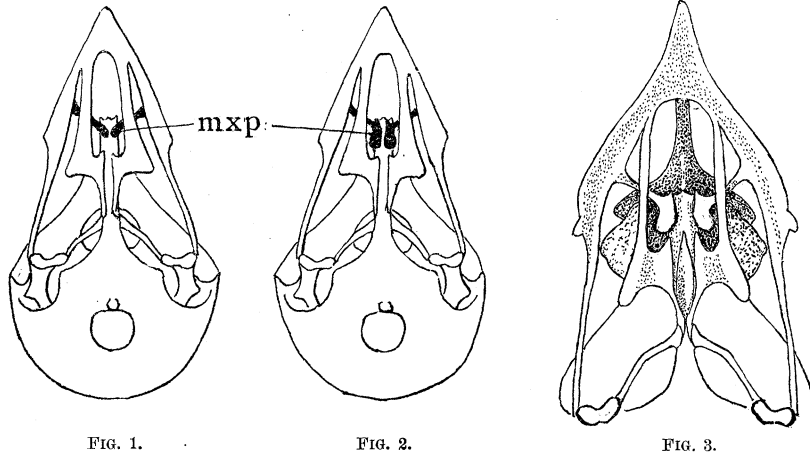


FIG. 1.

FIG. 2.

FIG. 3.

cartilaginous mass very like the better-developed fifth metacarpal.

Examination of the skeleton of aurochs in the U.S. national museum shows that the facets for the articulation of the fifth metacarpal are much larger and more sharply defined than are those for the articulation of the second.

Owen notes that the genus *Bison* has two small metacarpals, and it would seem safe to assume that this is the normal number, the Cambridge skeleton being in this respect abnormal.

The deductions that I would make are these:—

1. *Bison bonasus* possesses two rudimentary metacarpals, both of which articulate with the common bone by arthrodial facets.

2. *Bison americanus* possesses two rudimentary metacarpals, but the outer one alone regularly articulates with the cannon bone.

To Dr. Slade, however, belongs the credit of pointing out that in this respect the American and European bison are different, and that the American is just a shade more modified.

FREDERIC A. LUCAS.

Washington, D.C., April 29.

differed *in toto* with those of the skull figured by Dr. Shufeldt. On the strength of these facts, I ventured to state that the figure was imperfect in this particular; and a skull of *T. thalassina* since procured has the maxillo-palatines like those of its relatives. Of the accompanying figures, fig. 1 is a tracing of Dr. Shufeldt's figure in the Proceedings of the zoological society, fig. 2 is the same figure with the maxillo-palatines drawn from a specimen in the national museum, while fig. 3 represents the palate of the purple martin (*Progne subis*), which shows the characteristic form of the Maxillo-palatines in the swallows. Fig. 2 is not quite so good as I would like, but there is no time to make a better figure. In the examination of scores of crania, representing many species of birds, I have never met with a single case of individual variation of the maxillo-palatine process, to say nothing of so great a departure from the specific type as that indicated in Dr. Shufeldt's figure. In fact, the shape of this process has been found very constant in closely allied species, all the thrushes examined having one pattern, the wrens another, and so on. This being the case, it would

seem unfortunate that the skull in the Proceedings of the zoölogical society should have been figured as a *typical* cranium, and that no mention should have been made of the fact that it was aberrant in so important a particular. FREDERIC A. LUCAS.

Washington, D.C., May 3.

Some trees.

In September of 1885, I was present at and assisted in the following measurements of an iron or lever-wood tree (*Ostry virginica*) on the grounds of Lyman Child, Esq., near Bethel village in Vermont: circumference at ground, 128 inches; one foot above ground, 83 inches; four feet above ground, 69 inches; with corresponding diameters of 3 feet 7 inches, 2 feet 7 inches, and 1 foot 11 inches; height of tree, 38 feet; lateral extent of branches, 47 feet. It stands on a barren, precipitous hillside, and can find nutriment in little else than the disintegrated granite rock. In much travel and a long life in east and west, I have never seen one but this, of even one-half this size.

At Excelsior Springs in Clay county, Mo., some thirty miles from Kansas City, stands a maple (*Acer Sach*) and white-oak (*Quercus alba*) joined in one symmetrical body, from the ground up about six feet; thence dividing into two separate trees of some fifteen to eighteen inches diameter each. The line of union of the bodies is only indicated by a slight crowding of the bark.

Near the same Excelsior Springs an oak and maple of some twelve inches diameter each, stand at the ground two feet apart. At about fifteen feet above the ground, in their earlier growth, a limb from the maple was projected horizontally across the body of the oak. Time and growth have embedded the limb from the maple in the body of the oak; and now the appearance is, on the one side of the oak, an anastomosis with the maple by a three-inch arm, and, on the other side, a two-inch maple-limb produced from an oak-tree.

A slippery-elm tree (*Ulmus fulva*) stands in our yard here in Kansas City, of some thirty inches diameter, at one foot from the ground, and averaging twenty inches for twenty feet upwards, and thence twelve inches for forty feet; entire height, about eighty feet. I find no such *Ulmus fulva* in Gray; but its sweetish, mucilaginous inner bark pronounces it a real *fulva*. Its terminal branches, often in whorls of from three to seven, are blunt and club-like, unlike the light pendant terminals of many of the American or white elms. Other specimens of this elm are in the vicinity, but not often so symmetrical in form. A. L. CHILD, M.D.

Kansas City, Mo., May 3.

The Daniel Scholl observatory.

It occurred to me that it might be of interest to you and your readers to hear that in the old historic town of Lancaster City, Penn., an observatory named the Daniel Scholl observatory has been erected on the grounds of Franklin and Marshall college. The equipments consist of meteorological apparatus, chronometer, Seth Thomas thirty-day regulator, chronograph, transit instrument of three inches aperture, and a Clark-Repsold equatorial telescope of eleven inches aperture. The telescope has a set of negative and positive eye-pieces, with reversion prisms for three of the micrometer eye-

pieces, a Mertz solar eye-piece, and a comet eye-piece, together with a micrometer with complete illuminating apparatus for bright and dark field as worked out by the Repsolds. Since this is comparatively new, and, as far as we know, the only micrometer and purely equatorial mounting by Repsold in this country, we thought it might be of some interest to those who have not had the opportunity to see this form of mounting and micrometer.

JEFFERSON E. KERSHNER.

Lancaster City, Penn., May 7.

Death of Prof. William Ashburner.

William Ashburner, the well-known mining engineer of San Francisco, died in that city, April 20, after a brief illness. The deceased held a high place in his profession, and was greatly esteemed by all who knew him. He was born in Stockbridge, Mass., in 1831. He attended the public schools of his native town. In 1849 he entered the Lawrence scientific school at Cambridge, and after two years went to Paris, where he pursued such studies as are requisite to the profession of mining engineer, at the Ecole des mines. In 1854 he returned to this country, and, accompanied by the late Professor Rivot, he devoted several months to the examination of the mineral region of Lake Superior. In 1859 he was engaged in the exploration of a part of the island of Newfoundland, and in 1860 he went to California as one of the chief assistants in the state geological survey of which Prof. J. D. Whitney was the director. In 1864 he was appointed one of the commissioners of the Yosemite Valley and the Mariposa Big-Tree Grove, a position he held until 1880. From 1862 until 1883 Professor Ashburner was actively engaged in his professional work, and travelled almost incessantly in the mining districts of the United States, British Columbia, and Mexico, also in the more distant regions of South America and Asia.

In 1874 he was made professor of mining in the University of California, and subsequently honorary professor of mining in the same college. In 1880 he was appointed by the governor, regent of said university, and was a member of the board of regents at the time of his death. He was selected by the late James Lick as one of the trustees of the California school of mechanical arts, this latter being one of Mr. Lick's public benefactions, and was also chosen by Mr. Stanford one of the trustees of the Leland Stanford, jun., university. Professor Ashburner was otherwise prominent in various scientific and educational societies, particularly in the California academy of sciences, in which for many years he was one of the trustees. He was also a member of the microscopical, historical, and geographical societies of San Francisco.

In the community in which he lived for so many years, he was universally recognized as a public-spirited and honorable gentleman. His quiet and unostentatious manners, as well as other agreeable personal qualities, endeared him to a large circle of friends.

The enthusiastic and active interest he took in every thing conducive to the growth and intellectual advancement of the Pacific coast made him a valuable citizen, and his death may well be regarded as a public loss.

R. E. C. S.

Smithsonian institution, Washington, May 9.

SCIENCE.—SUPPLEMENT.

FRIDAY, MAY 13, 1887.

THE RESPECTIVE FUNCTIONS IN EDUCATION, OF PRIMARY, SECONDARY, AND UNIVERSITY SCHOOLS.¹ — II.

I. I HAVE said that the chief aim of the primary school is the nutrition of feeling, inner and outer. The child is receptive, and his will is weak. This receptivity is a wise provision of nature for future growth. To all the primary sentiments which distinguish man, the child is more open than the youth. You may play what tune you please on his sensitive chords. Let us take care that it is always a melody, and not a discord of jarring notes. No educational enthusiast has ever yet exaggerated the impressionability of the child, his capacity for the emotions which lie at the basis of all our moral life. Love, tenderness, sympathy, the approbation of others, veneration, nay, even the spirit of sacrifice, and even a certain dim imagination of the harmonious play of all the finer feelings, are all ready, nay, anxious, to be stirred into activity. Response is eager. It even anticipates appeals. What, after all, do our greatest heroes show to the admiring crowd but simply these primary sentiments gathered into a unity of life in them, directed to some great purpose, furnishing the motive forces of their greatest deeds? You have in these primary feelings the well-spring of all life. Do not distrust them. Believe in them. The child before you is not an incarnation of depravity. That is an old-world fable. He is nearer God than you are. Heaven lies about him. Christ did not say 'Of such is the kingdom of heaven' to furnish a text for the glosses and distortions of theologians in their bilious moments. Depend upon it, he meant it. It is by the watchful guidance and gentle admonition of the child that you lead him to the right and good. You do not *supply* motives for his daily acts, you evoke them out of himself. They are there waiting to be turned to use. It is your privilege to touch him to fine issues. Your business is to be watchful, but not suspicious. The loving hand pointing the right way, the warning finger (with perchance a smile behind it) blocking the wrong path, the supporting of the weak will with your strength, — these are your methods. To preach is futile. Food so offered will be rejected.

¹ Paper read at the Educational congress, Edinburgh, Dec. 31, 1886.

It is by the presentation to the open mind of individual instances, the direction and encouragement of individual acts, that you give the sustenance the child needs; above all, by making *yourself* a particular instance, always present to him, of kindness, of justice, of mercy, though not without the occasional anger that 'sins not.' In such teaching, severity and harshness are surely out of place. I often smile in schools at the solemn exaggeration of children's offences when I compare their young untried souls with the tarnished conscience of their teacher, the aggregation of iniquities which are incarnated in the dominating and indignant master. He, forsooth, is virtue: the child is vice. Look on this picture and on that! Does it not ever occur to him how gladly even he — magister, dominus, scholasticus — would change places with those young souls?

"Not poppy, nor mandragora,
Nor all the drowsy sirups of the world,
Shall ever medicine us to that sweet sleep
Which we owed yesterday."

But enough of this: the aim of the primary school, I repeat, is nutrition of inner feeling, of the emotions and sentiments through particular instances. The soil is thereby enriched and prepared for the harvest virtue.

But nutrition of inner feeling is not all: there must be nutrition of outer feeling. The real of nature, as well as the real of emotion, is the material of primary education. It is life that educates. Outside the school-room the child lives in an ever-changing atmosphere of emotion chaotic and perplexing: inside the school-room the same life is to be found, but regulated, controlled, explained, enriched, by the teacher. So with the real of outer sense. Outside the school-room the child lives his life under sense conditions. He is feeling his way to the understanding of the objects around him. Nature, and the products of the hand of man working on the crude stuff of nature, press on him. He has to establish relations with all these, that he may use them for life and work and enjoyment. They are, in truth, the raw material which he has to shape to moral and spiritual ends. This outside life is also to be the inside life of the school. The teacher has to help the child to see, and understand, and to organize his impressions. Thus, when he goes out of the school, he goes out, not to a novel world, but to a world already experienced and now par-

tially explained by the teacher's better knowledge, and with an increase of the power of seeing and knowing and correlating.

Such, I think, is the function of the primary school as the nurse of feeling and the home of training, but not, as I have said, wholly without discipline. The voice of authority must always be heard. The child must learn that he lives and must live under law. The merely intellectual discipline is sufficiently insured by the acquisition of the subsidiary attainments of reading, writing, drawing, arithmetic, etc.

II. At the age of approaching puberty (about fourteen) we pass into a new sphere. At this age the boy tends to become boisterous, and the girl skittish. Our work now is mainly governed by the purpose of discipline. Law now meets and controls the turbulence of the phase through which the human spirit is passing. Nutrition, it is true, is never to be absent — nutrition which is possible alone through the real of inner feeling, and the real of outer nature; but if the foundations of the real have not been laid in the primary period, I doubt our success now. Opportunity is offered once to all. It may never be offered a second time. The teacher, at least, must assume this. The nutrition to be given now is the nutrition of law and duty.

Nature seems now to yearn for activity. The boy is no longer so ready to receive impressions as to make them. His will, or what he mistakes for his will, comes to the front, and in bodily and mental matters alike he loves to *do*. He cannot bear being talked *to* or talked *at*. He has opinions now. He judges with imbecile self-complacency things and men. He wants to show what *he* is, and what he can *do*. How are we to meet this? Really a difficult question. For we have, above all things, to let him grow, and growth is not possible with suppression: nay, suppression at this stage enslaves and converts the less bold into skulks and sneaks, and the more bold into evasive dodgers paltering with the truth, and both into contemnors of the pure and good. Here the boy himself points the way to the teacher. Work is what he needs, and wants. Let him have it. Let him be brought to face difficulties in learning, and, though some of the subjects want the attraction of the real, let him learn to master them by sheer force. Formal studies, — languages and mathematics, — with the rudiments of which he has been conversant in the latter portion of his primary stage, must now occupy more than one-half of his time. His specific moral life, again, can now no longer be stimulated or fostered by sentiment, as when he was a child, but only indirectly, and that by intercourse with

moral ideals in conduct. This is the age which can appreciate heroism, and understand the sterner and heroic virtues. So with ideals in the things of intellect and literary imagination. Art in literature will unconsciously impress him and mould him. We must not always improve upon the lessons: we must let him draw his own inferences. I believe much in literature at this stage as the chief real or nutritive element, in its silent influence on character, much more than I believe in the real of nature as presented in elementary science, because the concrete idea is not in it. This last too, however, must have its due and daily place. The order observable in the external world may possibly help to bring order into the internal chaos, which at present constitutes the boy, spite of all his pretentiousness and conceit.

But not only is his rampant will to be brought in contact with the hardships of intellectual work that it may face and overpower; his body also must be allowed its full activity. In gymnastic, and, above all, in organized games, he should find an outlet, and also a discipline, — the discipline of difficulties overcome and of law obeyed.

Thus between fourteen and eighteen we gradually subject the boy to law, and give him the priceless possession of concrete ideals in conduct — great personalities — and of art in literature. He is thus tamed, if not subjugated; and, when he approaches the gates of the university, his brave show of self-importance, were he dissected thoroughly, would be found to be hollow at the heart, and to mean little more than the walking-canes, neckties, and general masherdom by means of which he harmlessly works it off to the admiration of that other half of humanity, whom, formerly despised with all a boy's contempt, he now desires above all to attract. Desires to attract, I say; for it is not the fairer half of creation he is yet thinking of, but of himself alone as an irresistible object of admiration to that fairer half, — an excellent arrangement of nature, for thereby he forms an ideal of what he ought to be by seeing himself through the rapt eyes of imaginary admirers.

III. He is within the academic gates, and we have now to ask what is the function of the university in regard of him. I may be heretical, but I do not believe the university forms character. Character, in all its essential features, is already formed in the young matriculant. The home and the school have done this. The university may supplement their work: it cannot do it.

The function of the university has more close relation to that of the primary school than to that of the secondary school. Its aim is like that of the primary school, chiefly *nutrition*, but no

longer of feeling as in the primary, or of moral ideals and of law as in the secondary, but of ideas. Training and discipline are, it is true, involved in the true grasp of ideas, but they are not the university aim. The nutrition of ideas, — this is the great academic function, as I think. Nor are discipline and training to be given *by* the university, but by the student to himself. The youth has now escaped from the bondage of law. The university does its work when it unfolds the domain of knowledge to the opening adolescent mind, and invites it to enter in and take possession, and when it provides the material apparatus of self-instruction. The professor is only a guide and an example. The essence of university life is freedom for the student, and freedom for the professor. It is simply because the university has become a certifying and graduating body that even the calling of class-rolls is justifiable. Even as a graduating body, I doubt, after all, if it is justified in calling them. The professor offers to show the student the way to knowledge, and to teach him how to use the instruments of knowledge, whether they be books or microscopes; and there his function ends. If any parent is unwilling to send his son to the free life of a university, let him keep him at home and call in a trained nurse or a paternal tutor.

Self-discipline, self-training, through the pursuit of ideas which attract by their eternal and inherent charm all ingenuous spirits, — this is the purpose of a university. There can be no self-discipline without freedom. This is of the essence of mind: God has ordered it so. True, freedom may end in tasting of the tree that is forbidden, and in expulsion from Paradise. Be it so. Such is the universal condition of adolescent and adult life. By bringing to bear the school-master — the law — on the student, we make the unworthy less worthy, and the worthy we irritate and repress in their upward and onward striving.

What follows from this general view? Certain very practical results. Boys in years and boys in mind, though they be physically grown up, have no business within academic walls. Their place is the secondary school, where they may receive the intellectual and moral discipline which fits them to breathe the pure air of freedom and the rare ether of ideas. Freedom of study also, not compulsory curricula, is alone in place now.

And what are ideas? Shall I venture on a definition where Plato failed and Aristotle stumbled? I would rather not. And yet I know what I mean. For is not 'the true' an idea? And is not the pursuit of science and philosophy the pursuit of the true? At these academic gates the student is

to cast aside the idols of the den and of the market-place, and, unencumbered, to question and to investigate in loyal obedience to the divine summons to *know*. In philology, in philosophy, in the study of nature in its many forms, in art, he is called upon to look face to face with the true, the good, and the beautiful. Even when the student himself is all unconscious of the divine presence in his ardent pursuit of material science, it is yet there, for his aim is the true. Step by step he is putting himself in harmony with the scheme of the universe, and preparing for the final illumining. The truth of this and of that he seeks for; but these separate truths are but the fragments of the whole, and lead him to the whole. He is always on his way upward. The conception of the unity of the whole, as seen in the wisdom and working of the eternal Reason, teaching him by the things which He has made, awaits him. The student-spirit is thus brought into relation with the universal Spirit, which effects in him the fruits of the spirit; above all, harmony of soul and all the virtues.

It is philosophy, and history treated in a philosophical sense, that hold the key of the temple. And if philosophy should fail him, literature will be found to be a universal solvent; for in itself it is the creative thought of man on man cast in beautiful forms. It is a striving after the truest truth and a direct and informal penetration into the heart of things; it lives *in* the idea and *by* the ideal. Harmony of thought and life — a tie between all special knowledges — may be found here.

It is scarcely necessary to say, that, when I speak of science and philosophy, I speak of arts in the mediaeval sense, — the whole circle of rationalized knowledge. The merely professional studies which fit to be physician, theologian, lawyer, teacher, are mere dependences on the university properly conceived, mere accidents of the substance. The university itself was founded in arts, and still truly lives only by arts. An aggregate of professional colleges can never constitute a university. The idea is not there: it cannot live with the purely technical. Even in technical schools, at least if they are part of a university organization, no man is a fit professor who is not alive to the university idea in what he teaches, makes his students feel the intimate relations of all knowledge, the philosophy which permeates and gives significance to every subject. If the student does not attain to this, he has fallen short of the academic aim.

But how can the student breathe the purely scientific atmosphere if he does not come prepared? If he spends the years of his arts life in acquiring the mere instruments, linguistic and

mathematical, he can never enter the temple of science at all. At best he can take but a cursory peep. I am well aware that the world gets along by compromise, and I have no objection to a year or so being devoted to the mere instruments within the walls of a university; but let it be understood, that, even when we accept this, we must yet demand a much higher qualification in the matriculant than we do now. After a year spent among the instruments, the student, at the age of about nineteen, should be in a position to throw himself into real studies, — philology, philosophy, history, literature, art, physical science. To take the encyclopedic round would be impossible nowadays; but by the thorough investigation of a department he gains admission to the idea, and becomes a scientific thinker. Discipline in one department, properly understood and properly pursued, is discipline in all. He thereby attains to that reverence for all knowledge, and that large philosophical comprehension, which is the consummation of all true self-discipline. Thus it is that the mere intellect becomes permeated by the emotions which lie at the heart of all ideals, and becomes itself ideal and universal in its *personal* aims. This is what culture truly means.

Too briefly for the great subject, but not too briefly, I trust, for understanding, I have indicated the function of the university in education. Out of it the equipped man issues to encounter the buffets of life, and do the work which his hand findeth to do; but he can never forget that he has enrolled himself a citizen of the city of reason, and that he is a freeman of it by divine right.

All stages of educational progress you will, I trust, see gain their true significance, from their genuine ethical outcome, — their contribution to harmonious inner life, and harmonious outer living.

S. S. LAURIE.

COMPETITIVE EXAMINATIONS.¹

THE subject which I have chosen for this evening's discussion you will probably regard as a well-worn one. But the working of examinations has now undergone the test of a lengthened trial; and much of the controversy respecting their educational value, which raged some ten years ago, has in a great measure subsided.

It therefore occurred to me that a retrospective view of what has been said or written by advocates on both sides of the question might be useful, if taken in the light of our accumulated experience.

It will be in the memory of most of us, that,

¹ From the *Educational times*, April 1. A paper read before the College of preceptors.

between the years 1870 and 1880, our magazines teemed with articles on the subject; and there is so much that is suggestive and worth recording, that I must crave your indulgence for making frequent extracts from different papers. According as writers were interested in maintaining the old public-school system of education, or the system supported by the modern examination coach and so-called 'crammer,' they ranged themselves against or in favor of competitive examinations.

Some of the arguments hurled at the concoctors and upholders of the examination system were the following: —

Examinations led to cramming on the part of the candidates; i.e., preparation by pure memory-work, leading to a parrot-like acquaintance with facts and phrases, and even this knowledge quite transitory, learned for the purpose of the examination, and forgotten as soon as it was over.

The reasoning-powers were said to be stultified by disuse.

Imagination and originality were crushed.

The strain of competition would undermine the health of the young.

The artificial stimulus of competition would take the place of a healthy love of study for its own sake, and, when withdrawn, the genuine interest in work would never return.

In the Indian civil service the result would be that the worst candidates would be selected, and the best rejected.

On the other hand, the advocates of examinations contested these points one by one, and maintained the opposite conclusions. They affirmed that the competition and rivalry excited was a positive good in the training of the young; that, to make a great struggle for a place in an examination, even but once in a lifetime, was itself an education to a naturally indolent mind; that the system afforded the only method, free from chance or favoritism, of selecting candidates for innumerable appointments in life. They also maintained (and not without reason) that prizes for learning, and orders of merit, advanced the character of the teaching given to the whole of a school.

Amongst the opponents of the system, we find Dr. Birdwood, in an address before the Society of arts about the year 1873, — an address indorsed and eulogized by the *Standard* in a leading article at that time, — denounced the army and civil-service tutors as "a gang of examiners, and the directors of the new East India competitive examination Dodge company." But in this anathema it is clear that he ought to have included the civil-service commissioners, who are the real directors of those examinations.

The *Fortnightly* for June, 1875, contains a long article by Professor Sayce, which, from beginning to end, is a tirade against the whole system.

From much that has been written tending in the same direction, it will suffice to make an extract from a very able article by Mark Pattison, in No. 1 of *Mind*, 1873, bearing the title 'Philosophy at Oxford:—'

"The whole of the literary and philosophical teaching in Oxford is in the hands of young men,—the tutors of the colleges. As a class, these men abound, when they begin life, in energy and ability. They overflow with zeal, and the desire to act upon their pupils. But the zeal is not the zeal of the enthusiastic votary of science, who sees a vista of infinite progress opening before him, and desires to associate younger minds in following up the track. The young teacher, as turned out by us, has never been on any such track. He is an honor-man and a prizeman; *voilà tout!* and he knows the sure road to make others win honors and prizes, the road by which he himself won them. He is embarked on the career of teaching at twenty-five, say, and he finds himself at once the slave of a great teaching-engine, which drives him day by day in a round of mechanical work."

On the mode of preparation for examinations in philosophy, he goes on to say,—

"For two years the pupil is forced along a false road of study, in which neither science nor philosophy encounters him. Memory is really almost the only faculty called into play. Were they facts with which the memory is thus charged, the inadequacy of the system would be apparent at once. But in the preparation for this examination, instead of facts, the memory is charged with generalized formulas, with expressions and solutions, which are derived ready-made from the tutor. The first principle of philosophical, nay, of intellectual training, viz., that all should be deduced from the pupil's own mind, is here inverted: all is poured into him by his teacher. The teacher does as much, and the pupil as little, as possible. The utmost that the student can acquire from the system is, that he has learned to write in the newest style of thought, and to manipulate the phrases of the last popular treatise."

Later on, however, we find more moderate views prevailing. In the *Nineteenth century* for April, 1878, Canon Barry of King's college, London, writing on 'The good and evil of examinations,' says,—

"We can now afford to take the wise advice of Carlyle, 'to stop shrieking, and inquire.' There seems to be no inconsiderable danger that to an exaggerated trust in examinations there may succeed an excessive and indiscriminate condemna-

tion of them. Whenever one party vaunts a medicine as a panacea, their opponents are seldom content without denouncing it as a mere sham, or perhaps a deadly poison. . . . I hold it possible, by an examination, deliberately and carefully conducted, to test and to estimate, in those who are submitted to it, not only formed knowledge on this or that subject, but intelligence, thoughtfulness, and promise of future growth."

The whole subject will be found exhaustively treated in Todhunter's 'Conflict of studies,' 1873, and, four years later, in Latham's 'Action of examinations.'

First and foremost amongst the evil things which have been charged to the account of examinations is *cramming*.

Now, if the nature of competitive examinations is such as to involve, as the necessary and sufficient preparation for passing, the storing the memory with a mass of unclassified facts, and the accumulation of a huge heap of undigested knowledge, then the ultimate benefit accruing to the candidate is easy to foresee: it will be of the smallest possible amount, or the result may be even positively injurious to him. An examination which necessitated a mental process of this kind would be framed in the worst possible way, yet I find that it is such a process as this which is popularly denoted by 'cramming.' The term must therefore be equivalent to 'preparation for a bad examination.' But are all or any of the existing public examinations of this description?

That many candidates attempt to pass these by acquiring a mere mnemonic acquaintance with the several subjects, and that a very few succeed in the attempt, is the probable truth; but to infer that most of the candidates do so, is an *ex pede Herculem* mode of reasoning, the fallaciousness of which appears at once. For, let any one carefully inspect the papers set in the university, the Indian civil service, and the Woolwich examinations, and then ask himself if it be possible for a successful preparation for any one of these to be accomplished by the process of unintelligent 'cramming' just described. The answer ought to be an unqualified negative, and must be so if the examiners do their duty. In fact, much of the charge of inefficiency brought against these examinations must be borne by those who originate and conduct them. On this point, Canon Barry holds similar views, and says,—

"I maintain that an examination ought always to be able to defeat those crammers, who are properly so called. If it does not, the fault is to be traced to the imperfect discharge of duty by examiners. Those who carelessly set stock questions, and questions which can be answered by

memory without thought, or make their papers a field for the exhibition of their own cleverness and their own peculiar theories (without considering what may rightly be expected from the young men or boys examined, and what is therefore likely really to test their knowledge and capacity), simply court failure. There seems to be too little appreciation of the exceeding difficulty of the task of thorough examination. Examiners are burdened with a mass of work which they cannot get through except in a perfunctory manner, and which even then so utterly wearies them out, that this faculty of judgment and comparison is lost. They themselves sometimes seem to act as if any thing would do for an examination paper, and, unless they are strangely belied, are far from preserving a uniform standard in their arbitrary and irrevocable decisions. But the fault lies, not in the principle, but in the administration. It is remedied, not by giving up examinations, but by examining better."

In the address before referred to, Dr. Birdwood expressed the views held, then and now, by a considerable class, when, after drawing an ideal picture of the lamentable effects of this so-called system of cramming upon the Indian civil service, he boldly proposes, as a remedy, to hand over all the appointments to the universities and the public schools. This advice is doubtless consistent. If the knowledge which it is at present necessary for candidates to acquire, over and above that which they can obtain at the public schools, is only so much useless rubbish, unfitting instead of fitting them for the sphere in which they have to act, then the sooner it is dispensed with, the better. But it is difficult to discover where the *gravamen* of the accusation lies. The fact that a special education of a higher order than that which the public schools will give is required by the civil-service commissioners is obvious enough; but it is not easy to see how a better education can make a man worse: it certainly cannot be proved to do so by giving it an uncouth name. The rapid strides of science, and its intimate relation to all civilization and progress at the present day, led the commissioners to recognize the truth that a wider foundation than heretofore had to be laid for the education of those who are destined to take active service in the field. For the mere onlookers, a liberal education, according to the ideas of the old *régime*, may suffice. The public schools may remain faithful to the traditions of the past, and continue to insist that two dead languages constitute for all time the one necessary and sufficient basis for the complete education of the Anglo-Saxon. But the world will not stand still forever to worship this

ancient 'idol of the den.' The movement which has resulted in draining, year after year, some of the best blood from our public schools, is but the beginning of a process which will ere long leave them dry and lifeless, if they persist in disregarding the signs of the times. It would be as useful to make technical botany, geology, or chemistry the universal substratum of school-education, as the Latin and Greek tongues; for the average school-boy never gets beyond the dead symbol of the language, which bears no fruit for him. The philosophy of history, the poetry, wisdom, and learning of the ancients, all that constitutes the hidden life of such studies, is lost to him through the obscurity of the medium. Neither can he arrive at this knowledge in such a way, any more than the ear can arrive at sweet sounds by learning the rules of harmony and thorough bass. And just at the time when those studies might begin to educate, in the true sense of the word, they are laid aside forever.

The charge of specialty and inutility which has been brought against the civil-service examinations is singularly inappropriate. We find the following astounding statement: "The training required (that is, for the civil-service examinations) was absolutely injurious, and was good only for the competitive examination itself, and worthless for all else beyond as well as below it. To fail in the examination was bankruptcy in purse, in mind, and in soul." Now, since the subjects in which the specialty consists are almost wholly comprised under the heads of modern languages, literature, and some of the chief branches of physical science, — subjects the knowledge of which forms the very life-blood of our social and commercial systems, — it is impossible to conceive that the circumstance of having paid more than ordinary attention to such branches of study could unfit a young man for making his own unaided way in the world, after having failed to secure a civil-service appointment. In fact, the argument, such as it is, recoils with tenfold force upon the public schools with which the comparison is instituted. It is there that the course of education pursued is special, and the results comparatively worthless. It is there that subjects which are of use only to the man of letters, or the professional linguist, are dragged into undue prominence, and made to form the staple of the instruction offered, without discrimination, to all. If the hypothetical youth who has been early stranded in life had just left a public school, he would perhaps have acquired a facility in writing execrable Latin hexameters, or in making equally bad translations of Euripides; but in the elementary knowledge useful in a score of professions he would be utterly and hopelessly

ignorant. In truth, if the heroes of Greek and Roman mythology had been indeed divine, we could hardly have expressed our belief and devotion more practically than by adopting the grammar of their language as the common basis of education in the nineteenth century. Perhaps the afflatus still clings to the disused words, and man's progressive improvement may somehow be indissolubly connected with the repeated incantation.

We are told that the public schools produce 'formed men,' and the competitive examinations 'crammed men;' but the antithesis is not clear, and definitions of the terms employed would have been acceptable. It is doubtless true that independence of spirit and self-reliance are created at the public schools, and the result, as far as it goes, may be very valuable; but intellectual training is at least of equal importance with social in formation of character, and it is the former that we assert to be inefficient. The term 'cramming' is either a perfect myth, as Mr. Todhunter has affirmed it to be, so far as it has reference to the examinations in the University of Cambridge; or, if its present application be a legitimate one, it means, in the pupil, more than usually hard and intelligent study, and, in the tutor, thorough and painstaking teaching. The boy who is taken from the public schools to be 'crammed' for the competitive examination, is brought into incessant contact with his tutors, is individually assisted in his studies, his difficulties are explained, and, if idle, he is perpetually encouraged to work. The specialty of the method consists in giving individual attention to each pupil, and so, by obviating waste of time and waste of effort, enabling each to take the shortest road to the end desired. It is obvious that such a method involves more actual teaching; yet with reference to the expense attending this tuition, and which has been represented as enormous, I am confident that a fair average would show that it does not surpass, even if it equals, the cost of education at the public schools. It is impossible to resist suggesting an amendment to Dr. Birdwood's proposal. Let the public schools alter their curriculum to suit the requirements of the competitive examinations, and treble their staff of masters, and let them do this without raising the school fees, and they will at once become formidable rivals of the so-called crammers.

Granted, however, that the evils complained of, and so much exaggerated, exist in any degree whatever, the subject is one which demands immediate and serious attention. The whole tone of education in this country is being influenced, and in some directions entirely determined, by the character of competitive examinations. And it is

therefore hardly possible to overrate the importance which attaches to these examinations, and to the question 'How can they be made most serviceable?' In the last edition of the 'Encyclopædia Britannica' there are some pertinent remarks on this head. The writer says,—

"It is found that some branches of study are better suited for examination than others. Certain studies endow the pupil with the faculty of *doing* something he could not do before, such as translating foreign languages, or solving mathematical problems; and there are others, like history, which, though they may add greatly to the wealth of the man's mind, yield no such definite faculty or technical dexterity. We can test the possession of the first sort of acquirement directly, by calling on the student to put in practice the powers he is expected to have acquired; but, with respect to the latter, we can only ascertain that he recollects some portion of what he has prepared. By choosing these portions judiciously, we can tell whether the student has carefully studied the subject and linked the various parts of it together, but we cannot make sure of the permanency of this knowledge. Young men used to examinations will pick up just the information suited in a very short time, from an analysis or a tutor's note-book, and forget much in a few days. This power of 'getting up' and carrying is not without practical value. It is the power which enables a lawyer to master a mass of details, and we may allow credit for this, for it shows a good analytical memory; but it must be observed that what is thus rewarded is not so much a knowledge of the special branch of study, as a *power of acquiring*, which, very probably, might be applied to one subject as well as another. It requires great experience and judgment in an examiner to deal with subjects like history and literature. He must have an eye for the cardinal points, and must know how a student ought to hold things together in his mind. If he yield to the temptation which seems to beset examiners, of picking out 'things not generally known,' and minute details which a wise man is content to leave to be looked up when he wants them, then a kind of artificial knowledge, solely for use in examinations, will be engendered."

The opinion that there is something in the nature of examinations which renders them, of necessity, not only inefficient as a test of mental culture, but absolutely prejudicial to the interests of education in general, is, I am convinced, erroneous. I believe that the capabilities of the competitive examination, regarded as an instrument for directing education and for proving its results, have never yet been fully recognized. I do not think that attention has been concentrated upon

the subject which its importance demands; and the reason for this may be, that the real magnitude of the effect producible through the agency of these examinations is overlooked; and this is partly through the simplicity of the agent itself, and partly on account of the difficulty of observing the subsequent effects upon individuals. It is curious to compare the seeming inadequacy of the means employed with the actual vastness of the result. Some dozen or twenty questions are set in each of a few papers once or twice a year, and the whole machinery of education in innumerable schools and colleges is guided at the will and pleasure of the examiner. The instrument placed in his hands is the examination paper, and he can fashion it as he pleases. Any branch of study may be admitted or excluded, and I maintain that it is in the power of the examiner, not only by the selection of questions to give prominence to any particular department of the subject of a paper, but also by judicious apportionment of marks to give weight to certain mental excellences of the candidate over and above the mere exercise of memory and rule of thumb. No doubt a discrimination of this kind is already exercised in some degree: but, in order that such a method of awarding marks should become practically effective, it would be necessary that a complete understanding should exist between the examiner on the one hand, and the pupil on the other; for, since all efforts of the candidate, both before and during examination, are certain to be regulated by his idea of what will be likely to pay, it is evident, that, if his notions on this point differ widely from those of the examiner, the best intentions of the latter may be frustrated. As examinations are at present conducted, very little or no information is given about the method of marking adopted. The one fact ever present to the mind of the candidate is that he has to answer correctly the largest number of questions he can within the allotted time.

For the sake of illustrating what is, perhaps, the most serious defect in this system of examination against time, let us suppose the case of two students in mathematics, A and B. A is brilliant, but not profound. B is profound, but slow. Six questions being proposed to them on paper, A answers them all in one hour, while B only answers four out of the six in the same time. Again, six more advanced questions being set, requiring more original thought, A is unable to answer any one of these, but B answers them all in five hours.

Now, suppose A and B to compete for mathematical honors at Cambridge, in the old tripos examination. A number of questions of the first sort, all within the scope of A's ability, are answered

by him in the allotted time; B answers two-thirds of that number, and is accordingly beaten by A. The paper probably contains no questions of the second sort, and, even if it did, B would not venture to grapple with them, being deterred by the fear of losing marks, since in the time which the solution of one of these questions would take he would be able to deal with three or four of the easier ones. That such a result would be mischievous, will probably be admitted. In the ordinary affairs of life it is rarely of any consequence, when a matter is submitted to the judgment for decision, whether five or ten or fifteen minutes be occupied in coming to a conclusion. In the higher walks of science it is positively of no consequence whatever, the importance of arriving at a truth at all outweighing all consideration of the time occupied in the process. As an original investigator, A would be altogether surpassed by B. Why, then, should a premium be offered to mere rapidity of thought, in preference to any other excellences which might be displayed, in an examination the avowed object of which is to gauge the mathematical abilities of the competitors? If such ability as that of A's were usually allied with power, the objection would lose its weight, but the rule is probably the reverse of this: slowness is found allied with profundity and strength, quickness of conception with lack of great mental power.

Often the real difficulty of a question does not appear on the surface, and much time is frequently wasted in exploring the paper, and in attacking questions which have to be relinquished when their real difficulty is perceived; and in this way chance has much to do with the results, for nothing short of a deliberate analysis of the contents of the paper (for which there is not time) would enable the candidate to do himself justice by attacking those questions which alone he would be able to answer in the time allowed. It would also tend to definiteness of aim in preparing for any examination, if it were clearly stated by the examiners that marks would be accorded for certain excellences in the style of answering questions, and marks deducted for certain blemishes; and the more minutely all this could be specified, the less random would the results become, also the more would the character of that course of education, which it ought to be the sole object of the examinations to render perfect, be brought under the influence and direction of the examiners.

What I wish to insist upon is, that the evils which have been complained of as belonging to the system are not evils inherent in competitive examinations as such, but that they are due, wherever they exist, to accidental imperfections

in the mode of carrying out such examinations. It is obvious that any elaboration of the scheme of examinations, of the kind which I have very imperfectly suggested, would increase the labor and cost of conducting them. To insure satisfactory results, it might prove needful to engage a whole committee of examiners where but one is at present employed. Still, in view of the overwhelming importance of the effects of these examinations upon the education of the youth of this country, any objections to change founded upon considerations of economy must be regarded as trivial.

In conclusion, I may say that there appears to be a consensus of opinion in favor of the pass examination, with the subsequent arrangement of candidates alphabetically in one, two, or three divisions, thus reducing competition to a minimum. The College of preceptors has, I believe, never swerved from this principle, and a justification of it is surely afforded by the very marked success which has attended their examinations for a long period of years. The dangers, such as they are, cluster round the competitive examination, with its order of merit attached; and it is pretty generally agreed that young people should not very frequently be called to engage in these contests.

G. S. CARR.

THE LONDON COLLEGE OF PRECEPTORS.

THE erection and dedication of a handsome new building for the use of the London College of preceptors has called renewed attention to a most serviceable institution, and one which American educators should know something about. A writer in the *Athenaeum* gives a summary of its history. It is this college, far more than the ancient universities, that regulates and directs the education of the English middle classes.

The College of preceptors had a humble beginning. In 1846 some private school-masters, impressed with the ignorance and incompetence of numbers who called themselves teachers, met together, and ultimately resolved to form themselves into a society with the object of affording to the public a test of the qualification of teachers, and of thus, in course of time, excluding from the ranks of the profession all charlatans and impostors. The college increased rapidly in numbers, and secured the interest of distinguished patrons, among them the late Marquis of Northampton and Sir John Lubbock, by whose aid it succeeded in obtaining the royal charter by which it was incorporated in 1849. The preamble of this charter embodies very clearly the views of the original founders. The college is incorporated

“for the purpose of promoting sound learning, and of advancing the interests of education, especially among the middle classes, by affording facilities to the teacher for acquiring a knowledge of his profession, and by providing for the periodical session of a competent board of examiners, to ascertain and give certificates of the acquirements and fitness for their office of persons engaged, or desiring to be engaged, in the education of youth.” These primary objects of the college, it may at once be said, have hitherto been carried out but to a limited extent and with small success. At first, by a strange irony of fate, the result of its operations was to aggravate the evil it sought to cure. In the report of the schools inquiry commission, Mr. Fitch stated that in his district the objects of the college had not been fulfilled to any appreciable extent, and that several school-masters of good standing who had once supported it “had withdrawn themselves in disgust at the shameless use which was made in advertisements of the letters M.R.C.P. by men who were wholly unqualified;” and as late as 1868 Mr. Joseph Payne, in a paper read at a meeting of the college, put the plain spoken question, “Can any one wonder that school-masters by hundreds, finding that high rank in a learned corporation was to be obtained at the rate of seven shillings a letter, should have availed themselves of the golden opportunity?” The council have ever since steadily discountenanced the use or abuse of these mystic letters. The only grades the college recognizes for which diplomas are granted are associate, licentiate, and fellow. These grades are conferred after examination, partly in general knowledge, and partly in the theory and practice of education. The qualifications for the lowest grade are about on a par with those of a first-class certificated teacher, the licentiate corresponds to an ordinary degree, and the fellowship may fairly rank with an honor degree at the universities. The College of preceptors deserves full credit for having first recognized the necessity of a professional examination, and for setting an example which the older universities are slowly following. So far, it has succeeded in attracting few teachers, and those mostly of an inferior class; but the failure is due, not so much to any defects in the scheme, as to the general indifference of the public.

By far the most important event in the history of the college was the establishment of the examination of pupils. This was begun in 1850, and was in full operation in 1854; that is, four years before the university local examinations, and two years before those of the Society of arts. In spite of the competition from these and other examining boards, the college examinations have steadily

grown, till in the last year the numbers who presented themselves for the college certificates amounted to more than fifteen thousand, representing over four thousand schools. This number considerably exceeds the sum of the Oxford and Cambridge local candidates for 1886. Not only was the college first in the field of examinations, but it also took the lead in admitting girls to equal privileges with boys. Nor, as far as we can judge, is there any ground for the prevailing belief that the standard of the college is lower than that of the universities. Certainly this is not the opinion of the best judges, masters who prepare pupils for both examinations; and there can be no doubt that the examination syllabus of the college is more scientifically constructed, and insures a better curriculum for students, than that of either university. The explanation is obvious: it was originally drawn up, and has since been modified, not by university dons, but by practical school-masters.

A few words may be added as to the future of the college. In the past the main energies of the college have been expended on the examination of pupils; and probably few of its members are aware that there is not one word in their charter referring to such examinations, and that it is only by implication that they are authorized in conducting them and granting certificates. Now that the preceptors have built themselves a house, it is hoped that they will set to work in earnest to carry out the main intention of their founders. To offer examinations in the art of teaching is something; to provide lectures for teachers by such competent professors as Mr. James Sully, Canon Daniel, and Mr. Fitch, is more: but both these provisions combined fall far short of the training of teachers. This hope, we are glad to say, is likely to be fulfilled. At the last general meeting of the college, two resolutions were carried unanimously, — "that for the next three years a sum not exceeding three hundred pounds a year be devoted to scholarships for intending teachers, male and female;" and "that part of the surplus funds be allowed to accumulate for the purpose of establishing a training-college, or for promoting some other scheme for the training of teachers." These proposals appear to us most reasonable and prudent. The experiment of the Finsbury training-college proves that a superior normal school for men must for the present depend mainly on external support, and to launch out on such an undertaking without sufficient funds would be again to invite failure.

There are various other objects included in the charter of the college, to which it will doubtless hereafter apply itself. Such are a benevolent

fund for teachers, a pedagogic library, a bill for the registration of teachers; but, useful as all these objects are, they are subordinate to the primary aim of the college, the promotion of the training of teachers.

INFANT-SCHOOLS AND THE KINDERGARTEN.¹

Now that the universal necessity of education is recognized throughout the civilized world, the contest that remains is that concerning methods; and of this, the most important branch is that which relates to the very earliest period of education, namely, to the choice between the old system of the nursery or the infant schools, and that of Froebel, known as the kindergarten.

It would be obviously impossible to attempt here to give any thing like an exposition of this method, which was elaborated by its author as simply the first step and foundation of a systematically progressive education, extending from the earliest dawn to the ripening of the human faculties. The utmost that can be hoped for, in these brief remarks, is to bring into clear relief some of the most salient points of difference between the old and the new methods of infant-training.

First, then, apart from the inevitable effect of any school discipline upon the habits and conduct of children, the former aims mainly at instruction; the kindergarten, at harmonious development of the child's whole nature, instruction being a portion only of the training required for that purpose.

Next, as to the nature of the instruction given. The infant-school, which is bound to produce at a given time a certain proficiency in reading and writing, laboriously teaches the child to recognize and reproduce certain symbols, the real importance of which he naturally cannot realize. The kindergarten trains the child first to observe form, dimension, and number, in a great variety of amusing ways, with the help of color and of objects he can handle and examine. It teaches him to reproduce the forms observed, whether of natural objects or geometrical figures; to copy or combine out of his own fancy a variety of symmetrical designs, thereby giving a facility of apprehension and execution which makes the subsequent effort to recognize and trace letters and words comparatively easy. Thus the kindergarten system enables the children to attain the same proficiency in reading and writing, while much else has been learned on the way, and while the foundation has been laid for that accuracy and

¹ From the *London Journal of education*.

delicacy of sight and touch which will be of equal importance to the future mechanic, to the artist, or the man of science.

Again, the songs and movements of the infant-school afford a pleasant break in the graver work ; but the songs and games of the kindergarten are themselves an integral portion of the instruction. Through them the ear, the memory, and the intelligence are systematically exercised, while the children feel the charm of rhythmical expression and movement.

Once more. While, in any well-managed school, the children are fairly contented, in the kindergarten they are genuinely happy. Parents of all classes bear witness to this important fact, and it is true throughout the day's exercises, grave as well as gay. For while schools impose dry tasks, hard in proportion as they are uninteresting, because bearing no reference to childish tastes and aptitudes, the kindergarten, proceeding from close study of child-nature, follows and yet guides the child's own wish to learn, by presenting to him the facts or objects that naturally excite his curiosity ; thus, instead of the passive attitude of the mere enforced learner, we find even the youngest active, and happy in their activity. Nor must we forget, that, in fostering natural curiosity, we are fostering the root of the love of knowledge, the growth of which, however humble, is a treasure to any life, and which may become with many the perennial source of the noblest enjoyments.

To sum up, then. The new method is more according to nature, and therefore more successful, and making the children happier.

It is more comprehensive, and therefore not only richer in present gain, but more durable in its effects, since education influences the future just in proportion to the hold it has taken on the whole development of mental and physical faculty, the germs of which lie undeveloped in the child.

It is more religious in its influence, not through dogmatic teaching nor direct religious services, but through the daily rejoicing in God's works ; through the dawning sense of his presence and his ruling will in that wonderful outer world concerning which the child is so curious, and on which kindergarten-teaching is so continually fixing his attention. Thence gradually spring reverence and the sense of duty to that all-ruling power, and the vital roots of all religion are there.

Such being the superior claims of Froebel's method, it is most important to urge those claims upon all educational departments that include infant-schools, to induce them to adopt that method.

The only serious difficulty is that of providing duly trained teachers, since, in the hands of ill-trained mistresses, the surface, play-aspect of the kindergarten becomes the whole ; routine replaces principle ; and a system, every step of which has been philosophically thought out, becomes a mechanism or a toy.

What is required is, that training-colleges should know that their infant-school teachers will be expected to be thoroughly conversant with the kindergarten theory and practice, and that employers should require a certificate from a competent authority, vouching for such training. With these precautions, difficulties will speedily vanish.

EMILY SHIRREFF.

MR. ROMANES ON THE HIGHER EDUCATION OF WOMEN.

AUTHORITIES of all sorts, theological, medical, and pedagogical, have lately been heard from on this subject as to the higher education of women, until it has been thought that nothing is left unsaid. But so eminent a scientist and psychologist as Mr. Romanes can always command a hearing ; and in the course of a recent lecture at the Royal institution, on 'Mental differences between men and women,' he said not a little that directly interests educators. Mr. Romanes did not criticise the old-fashioned view as to the general mental inferiority of women, though he proceeded to uphold the more modern conclusion that women cannot be too highly educated. Ignorance, he said, is no longer one of those feminine qualities universally admired. It was not till the middle of the present century that any attempt was anywhere made to provide for the higher education of women. But now, whether we like it or not, the women's movement is upon us, and we must endeavor to guide the flood into the most beneficial channels. What are those channels ? Assuredly not those that run directly athwart all the mental differences of men and women. No education will ever equalize this natural inequality of sex, and women as a *class* will never aspire to rival men. Yet, though inferior in mere strength, whether of body or of mind, in the truest grandeur of human nature, in the higher moral qualities, women are at least the equals of men, and for the full development of their nature they need education as much as men. More especially do they need an education in science. Thanks to high schools and colleges, he hoped that it would no longer be possible for a presumably educated woman to put to a lecturer such questions as these : "Tell me, is the cerebellum inside or outside the brain ? Is your diagram of a jelly-fish intended

to illustrate the solar system? How have astronomers been so clever as to find out the names of the stars?" On the question of over-pressure, Mr. Romanes quoted the testimony of Mrs. Henry Sidgwick and Sir Spencer Wells, and stated that he had discovered but few cases of break-down. This proved, however, not that the system was perfect, but that English girls have marvellously vigorous constitutions. He then stated some grave abuses which had come to his knowledge, against which he desired to see public opinion directed. In some of the high schools, no check is placed on the ambition of young girls to distinguish themselves: there is no provision for bodily exercise, no play-ground, and the gymnasium, where there is one, is not used by the harder-worked students. A correspondent informed him that in one of the most famous high schools, girls usually began work at six, and worked ten or eleven hours a day: as examination approached, these hours were increased to fourteen, fifteen, sixteen, or even eighteen hours. The time fixed by the school time-table was, it is true, eight hours, but it was absolutely impossible for any girl to keep to this.

ENGLISH IN THE PREPARATORY SCHOOLS.

THE changes that have taken place in recent years in the methods of language-study have done much to advance the cause of good learning. Every teacher owes a lasting debt to those who have wrought out and to some extent perfected these new and advanced methods. The debt of the teacher is, however, but a tithe of that due from those who have thus been spared laborious and well-nigh fruitless gropings through the labyrinths of a complex grammar and the blind by-paths of inexplicable idioms. Where the new methods have been wisely held in check by a recognition of the legitimate functions of grammatical study, the results have been in the main entirely satisfactory. Languages are now learned much more rapidly and easily than was the case a few years ago, and are thus the earlier brought into requisition as the means to some other and better end. Parrot-like knowledge of inflections and rules has ceased to be the goal of linguistic scholarship: the ability to use a language as a medium between the possessor and something to be sought in literature or life, is now more generally recognized as the purpose of such studies and the main reason for them.

It is somewhat astonishing, that, in view of all this, some more practical and rational method has not been adopted in the study of our own lan-

guage as a vehicle of thought. In many of the colleges and universities there is, to be sure, a well-defined mania for philological research and an abnormal appetite for Anglo-Saxon roots. In our common schools this tendency is to some extent imitated by an unwearying attention to the minutiae of grammatical structure and the puzzles of syntactical forms. Of practice and humdrum drill in the use of English, there is little, in either school or college, in comparison with the importance of the subject and the needs of the students.

This lack of proper training in the use of English is due largely to two causes: 1^o, the want of some efficient method in the teaching of English; and, 2^o, the reluctance shown by our best teachers to engaging in this branch of work. Possibly the second reason may be the result of the first; possibly it is the result of some inherent prejudice, or some unconfessed doubts as to the dignity of this kind of work. As to these last reasons, it must be acknowledged, that, under the existing methods, the work is far from agreeable or inspiring to either teacher or taught, and no teacher can justly be blamed for preferring to avoid it whenever possible. The question may well be asked, however, whether this very reluctance is not one main cause why this important branch of work has been so long neglected, and whether, if our best-equipped and most earnest teachers were to apply themselves to a solution of the problem, it would not soon be solved as easily as were numerous other knotty problems in educational methods.

The writer has had occasion to test at college entrance examinations the familiarity of applicants with the forms and use of their mother-tongue. The results have been in the main unsatisfactory, and at times discouraging. The commonest grammatical forms seem entirely unfamiliar; a composition of a dozen sentences exhibits the most utter disregard of the simplest grammatical and rhetorical constructions. Students who construe Virgil with ease, who are on familiar terms with Euclid, and see no serious difficulties in Legendre, stumble and hesitate and fail in the use of their own language. To illustrate. At a recent examination the students were asked to decline the pronoun 'thou.' A large per cent of those examined failed utterly. Here are a few examples of how this inoffensive pronoun was treated:—

1. Thou, thine, thou; their, theirs, them.
2. Thou, yours, thou; same.
3. Thou, thine, thy; they, theirs, they.
4. Thou, thine, thee; they, theirs, them.

These four are fair examples of the whole list of failures. Nor must it be supposed that these young gentlemen had not been prepared in schools that stand fairly well. One was a graduate of a Massachusetts high school; one was a graduate of the preparatory department of one of the largest colleges in Ohio; two were prepared in New York high schools: the four taken together represent the educational system of three of the wealthiest, most populous, and most progressive states in the Union. In other simple grammatical forms a like ignorance was displayed; as, for instance, when one student declined Moses thus:—

Moses, Moses, Mosaic.

Such examples might be multiplied indefinitely, but these will suffice to prove how utterly inadequate is much of the preparatory instruction in the simple forms of our almost grammarless tongue.

When the work of writing English is considered, the results are almost equally barren. Scarcely an applicant for admission can write the simple essay required at the examination without some blunder in orthography, punctuation, capitalization, and, what is worst of all, grammatical accuracy. I say nothing of the faults in logical arrangement and rhetorical effectiveness. These qualities might, and indeed should, be taught in the preparatory schools; but I am sure every teacher of English in the colleges will be fully satisfied if students are sent up well equipped for writing English with grammatical correctness and some degree of ease. Such a foundation as this would enable the teacher to begin at once the work of aiding the student to acquire a clear and forcible style, instead of wasting time, as is now necessary, in doing the work of the preparatory schools.

The trouble seems to be that the preparatory schools do not, as a rule, give enough attention to the study of English. There is in the grammar schools a certain amount of grammatical drill and of analyzing and parsing. Much of this is good; much is worthless. So far as any useful end is concerned, the mere ability to analyze and parse an intricate English sentence counts for little. The ability to write a simple English sentence with accuracy and effectiveness would be of vastly greater advantage to the student. When the student attempts to pass an examination in any first-class college, this fact is made clearly evident. The main requirements at such a time are three,—first, the ability to recognize the few grammatical inflections that still persist in English, and to illustrate these, together with certain sentential constructions, by examples written at the exami-

nation; second, the ability to point out in sentences given at the examination the examples of false syntax and of offences against idiomatic English; third, the ability to write, on some familiar subject, a short composition which shall prove that the applicant possesses a reasonably full vocabulary, and is able to construct grammatical and idiomatic sentences and to combine them with ordinary skill. Of the three tests, the last named is by far the most important.

This brings us to a consideration of the work necessary to be done in the preparatory schools in order to fit students for college entrance examinations in English. In sketching this I shall not attempt to be exhaustive, but simply to indicate the main lines on which preparatory work ought to proceed.

1. There ought to be a thorough grounding of pupils in the inflections of English. This does not imply that pupils should be put through a severe course of training in all the niceties of grammar, but simply that the necessary inflections should be made perfectly familiar. For the accomplishment of this end, any one of the numerous 'methods' of language-study may be profitably employed; but it is my conviction that patient drill, accompanied by constant practice in the use of the various grammatical forms, is the best and simplest method. It cannot be too emphatically impressed upon the teacher that there ought, under any method, to be constant illustration, in actual work, of all difficult points in grammatical structure. It is especially important that the student be thoroughly drilled in the use of idiomatic English, and be taught to observe the distinction between closely related forms; as, for instance, 'shall' and 'will,' 'may' and 'can,' and other forms which persons ignorant of the idiom of the language are likely to confound.

2. There should be a reasonable amount of instruction in the simple intellectual qualities of English style. Dr. Abbott says, "Almost any English boy can be taught to write clearly, so far at least as clearness depends upon the arrangement of words. . . . [It] is a mere matter of adverbs, conjunctions, prepositions, and auxiliary verbs, placed and repeated according to definite rules."¹ Clearness is simply an intellectual quality, not depending, like strength and elegance, upon emotional or aesthetic gifts. Clearness, therefore, may easily be taught in the preparatory schools, and the principles and rules upon which it rests may be made a part of the intellectual equipment of the student. Beyond this it is useless to go. The study of rhetoric, in any proper sense of that term, is a waste of time, a source of confus-

¹ *How to write clearly*, pp. 5 and 6.

ion to students, and often an absolute hindrance to the acquisition of a good English style.

3. Throughout the entire course of a pupil's studies, from the time he can construct a simple sentence to the time he leaves the highest grade, there should be constant and rigorous drill in the writing of English. This part of the instruction is by far the most important, and is, at the same time, the part most frequently neglected. The writer has already published his views regarding the proper methods to be pursued in the teaching of English composition, and will not, therefore, go into that subject in this paper.¹ It is sufficient to say, in general terms, that all instruction in English composition should have constantly in view the immediate capabilities and needs of the students. It is no uncommon occurrence to have students in the lower classes of a college complain that they are asked to write upon subjects much simpler than those given in the high schools. Students who have been stringing together a lot of senseless verbiage on 'Sunshine and shadow,' 'True greatness,' 'Heroism,' 'Honesty,' and the like, cannot see why they should be asked to descend to the trivial matters of every-day life, and to a discussion of subjects about which they know something. Yet one composition written on a familiar subject, composed with reasonable care, and then carefully and sympathetically criticised by the teacher, is worth a dozen perfunctory affairs, hurriedly written, upon subjects entirely beyond the experience or knowledge of the pupil. Careful and conscientious work in English composition would afford the best possible basis for future studies in all fields. With this should go, if possible, a reasonable familiarity with good writers, in order that the vocabulary of the pupil might be enlarged, and models of good and wholesome English be constantly presented.

In conclusion, it is only just to say that the charge of neglecting the proper study of English does not lie at the door of the preparatory schools alone. It is only within very recent years that English has begun to receive a fair share of attention in the colleges and universities. The tendency of modern education is toward the practical. It is beginning to be seen that the most useful weapon in the hands of any scholar is a thorough and practical knowledge of his own language. This conviction is arousing our colleges to better methods of work in this department, and is, in consequence, making necessary better preparation in the secondary schools. This preparation they can and should provide.

ERNEST W. HUFFCUT.

¹ See the *New England journal of education* for December and January.

SCANDINAVIAN STUDIES IN THE UNITED STATES.

COMPLAINT has been made by many scholars that the study of the Scandinavian languages is almost entirely neglected in our colleges and universities, and that the general public is not alive to the importance of this study. Of the justice of the complaint there can be no doubt; but that the neglect is continually becoming less and less, it is my object to prove in this short paper. As no complete account of the Scandinavian movement in our colleges has ever been written, and as it is necessary, in order to arrive at a logical conclusion, that there should be a clear understanding of this movement, it may not be amiss if I preface my remarks with a brief sketch of the origin and development of Scandinavian studies in the United States. Though I have taken great pains to make the account complete, it is possible that some colleges may not receive the notice due them. Only college instruction will be discussed, the consideration of the purely literary side of the question being necessarily omitted.

To the University of the city of New York is due the credit of founding the first chair of the Scandinavian languages and literature. In 1858, Rev. Paul C. Sinding of Copenhagen was appointed the first professor in this department, and occupied the position, with honor to himself and the university, till his resignation in 1861. Professor Sinding's work had to do chiefly with Danish history and literature; and of the interest his work awakened in New York, we may judge from the fact that his 'History of Scandinavia' ran through seven editions in a few years. Since Professor Sinding's resignation, the chair has remained unoccupied.

In the same year that the study of the Scandinavian languages was abandoned in the University of the city of New York, the Norwegian Luther college was founded at Halfway Creek, Wis., and in 1862 was removed to Decorah, Io., where it is still located. It "owes its origin to the growing demand for educated men who could preach the Word of life to the rapidly increasing Norwegian population of this country." Luther college is, then, the first purely Scandinavian college in America. The instruction has always had a distinctively Norwegian tendency, and many of the text-books are printed in that language. The faculty and the students are almost entirely of Norwegian birth or parentage, and the Norwegian language and literature are studied through the whole college course.

On the opening of Cornell university in 1868, Willard Fiske was appointed professor of the North European languages, and instruction was

offered to students in Icelandic and Norwegian. In 1877, H. H. Boyesen was appointed assistant professor in the same department. Professor Boyesen resigned in 1880, and Professor Fiske in 1883, and since that time the department has been without a head.

In the same year that Cornell was founded, 1868, the example set by Luther college was followed by a Swedish colony in Illinois. The emigration from Sweden to this country had, in 1868, assumed such large proportions, that a Swedish theological seminary was established in Galesburg, Ill. Its object was the preparation of young men from the Methodist Episcopal church for the ministry. The seminary, which in 1882 was moved to Evanston, Ill., and united with the North-western university, is at present in a flourishing condition: "The course extends over three years, and the Swedish language and literature are studied throughout." In 1885 the Norwegian and Danish theological school was founded at the same university, and with similar aims. These two schools, together with Luther college, though quite unimportant from a philological stand-point, afford us ample proof of the practical side of the question as to the status of Scandinavian instruction in the United States.

In 1869, R. B. Anderson was appointed instructor in modern languages at the University of Wisconsin, offering a course in Icelandic, among others, — the first ever given in the United States. Six years later, Mr. Anderson was promoted to the position of professor of Scandinavian languages, which he continued to hold till his resignation in the autumn of 1883. During the remainder of that school-year, J. E. Olson taught a class of ten, in Icelandic. The following year, Mr. Olson was appointed instructor in the Scandinavian languages. At present, Mr. Olson has a class of thirteen members in Norse. Of the demand for instruction in this department, we may judge from the fact that there has been application from six students to begin a class in Icelandic. The Scandinavian languages were originally offered as optionals only; but soon after the creation of a separate department, Norse and Icelandic were offered as optionals in freshman and sophomore years, and as electives in junior, and, later still, also in senior years.

Next in order of time comes Columbia college, at present the only eastern college in which the Scandinavian languages can be studied. Instruction in Danish was first given by C. Sprague Smith, professor of modern languages during the winter of 1880-81, and in Swedish during the winter of 1882-83. In the fall of 1883, W. H. Carpenter, Ph.D., was appointed instructor in

German, Icelandic, Danish, and Swedish, having classes that year, of three each, in Icelandic and Danish. During the last winter, Dr. Carpenter had classes in Icelandic and Danish; Professor Boyesen, one in Swedish; and Professor Smith delivered a course of lectures on Danish and Swedish literature, with reading of texts. For the present year, in addition to the preceding courses, Professor Boyesen offers a seminar in contemporary Norwegian and Danish literature, with lectures and conversation in Norwegian.

Still another western institution, the University of Nebraska, offers this year, for the first time, facilities for Scandinavian work; A. H. Edgren, Ph.D., a native-born Swede, professor of Sanscrit and modern languages, being the instructor.

Such is the list, as complete as possible, of the colleges in the United States which have at any time offered instruction in the Scandinavian languages. In connection with the subject, it may not be amiss to mention some courses of lectures on Scandinavian literature, other than academic, that have been delivered in this country. Prof. R. B. Anderson has lectured at the Peabody institute, Baltimore, and in different cities in Indiana; Professor Boyesen, before the Lowell institute, Boston, and at Columbia college, 1886. In 1881-82, Y. Theo. Dippold, Ph.D., lectured on the *Nibelungen Lied* in Boston and Cambridge; and in 1882, Dr. Carpenter delivered a course of twelve lectures on Old Norse literature at Johns Hopkins university.

The question as to the profit accruing from the study of the Scandinavian languages naturally presents itself. The well-worn arguments that have been used so much of late by the opponents and defenders of the old-fashioned system of Latin, Greek, and mathematics, may many of them be used with equal force in arguing this question. If the mental discipline furnished by the study of Icelandic be as great as that furnished by the study of Latin and Greek, if the culture of the old Norsemen give as profitable food for reflection as does the culture of the Greeks and Romans, then Icelandic wins the day, and gains a right to a place in every college course. This paper is intended mainly as an account of what has been done in the past, rather than an argument for what shall be done in the future, so that I shall not attempt a support of my position, when I make the claim that in each of these particulars Icelandic equals both Greek and Latin. I say nothing of the national significance of Icelandic studies to all who call themselves Anglo-Saxons, though, in the opinion of many, this alone is enough to offset any possible advantage the older tongues may possess. But I wish to say a few

words on the practical advantage of the study of the Scandinavian languages.

We of the east can scarce realize the part the Scandinavian plays in the west: books and newspapers are printed for him in his own language; ministers preach the gospel to him in his own tongue; his presence is felt everywhere, save in the university and the college. A population of 107,768 Scandinavians lives in Minnesota, and there is not a college in which the parent tongues of this great mass of people can be studied. But in order to give a clearer idea of the extent of the Scandinavian settlements in the west, I have taken a few tables from the U. S. census for 1880 (vol. i. pp. 465 and 261):—

	Irish.	German.	English.	British American.	Scandinavian.
Minnesota.....	25,942	66,592	9,598	29,631	107,768
Wisconsin.....	41,907	184,328	30,268	28,965	66,284
Illinois.....	117,343	235,786	60,012	34,043	65,414
Iowa.....	44,061	88,268	25,550	21,097	46,046

That is, in Minnesota the Scandinavians outnumber any other two foreign nationalities; in Wisconsin they are outnumbered by the Germans alone; in Iowa they also stand second, and in Illinois third, in the proportion of foreign-born inhabitants. If we compare the percentage of Scandinavians with that of French, we find still more startling figures:—

	Scandinavian.	French.
1850	0.80	2.41
1860	1.75	2.66
1870	4.34	2.09
1880	6.59	1.60

What the percentage of Scandinavians in this country will be in 1890, we can surmise from these figures. That it is increasing with as great rapidity as ever before, is very probable.

And it is this great people whose language and literature are considered of such slight importance that in only three of our great colleges is any attention paid to their study. There are more Scandinavians in the United States than French, and there is not a college in the country in which French is not studied. It is true that the Scandinavian lan-

guages are but little used on the continent; but no one can depreciate a language that counts among its great names H. C. Andersen, Adam Oehlenschläger, H. C. Oersted, Karl von Linné, Björnsterne Björnson, Ibsen and Jonas Lie. Such a language deserves study for its own merits.

Yet a word on the three Scandinavian theological schools. The only medium by which the non-English-speaking Scandinavians can be reached, and taught to become good citizens, is by men of their own race and tongue, who must be specially trained for this work. The three Scandinavian colleges that have been established for this purpose have done and are doing good work in their own way; but unfortunately their way is not our way; in fact, the views of the Scandinavian religious bodies are directly opposed to every thing distinctively American. Instead of trying to Americanize the Scandinavian youth of the west, these missionaries do all they can to keep their charges in their present condition. They do not teach them even to use the English language, but rather encourage, intentionally or not, the survival of a foreign language on American soil. The Scandinavian courses in our western colleges should be intended, not only to teach Norwegian and Swedish to Americans, but also English to Norwegians and Swedes. Those working as spiritual or secular teachers among the Scandinavians, should use their knowledge of the two tongues to increase and encourage the adoption of English as the natural means of communication of this great population of ours. It may seem inconsistent to advocate the study of a language as a means of its own destruction, but in actual working this plan will prove to be a success.

DANIEL KILHAM DODGE.

A MAP of central Africa, based on the latest information, is now nearly ready, and will be published in an early number of *Science*. This will be the most accurate map of that region yet published in America, and will be the only American map which will enable readers to follow the journey of Stanley to the relief of the lost Egyptian army.